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TWENTY-FIRST ANNUAL REPORT

OF THE

BOSTON TRANSIT COMMISSION,

FOR THE YEAR ENDING

JUNE 30, 1915.

BOSTON
E. W. DOYLE, PRINTER
185 Franklin Street
1915

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BOSTON TRANSIT COMMISSION.

15 Beacon Street, Boston, June 30, 1915.

To the City Council of the City of Boston:—

In compliance with Statutes of 1894, chapter 548, section 24, the report of the Boston Transit Commission for the year ending June 30, 1915, is respectfully submitted.

Boylston Street Subway.

On September 9, 1914, the Chairman was authorized to notify the Boston Elevated Railway Company that the Commission was of opinion that the Boylston street subway would be ready for use September 21st so far as its work was concerned. An official inspection was made of the route on October 2nd, state and municipal officials being invited, and on October 3rd the subway was opened for public travel to the connection with the Tremont street subway near Carver street. (See Appendix A.)

At the date of this report bids are under consideration for the repaving of Boylston street, from Arlington street to near Carver street, with wood block pavement, as requested by the City.

Dorchester Tunnel.

The Dorchester tunnel, with the exception of Section D in Dewey square and Summer street, is substantially completed to the South Station, and Section D will probably be finished within a few months.

The contract for the construction of the portion of the tunnel under Fort Point Channel has been let to P. McGovern & Company, and the section in South Boston, between the Broadway station and Andrew square, to the T. A. Gillespie Company. In making the plans for this section (Section H) the Commission deemed it desirable to locate the subway in the

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center of Dorchester avenue in order to avoid rebuilding a large intercepting sewer at considerable expense. This location brought one of the sidewalls of the subway directly under the surface tracks of the Boston Elevated Railway Company and increased the difficulty and cost of construction. An arrangement was made between the contractor and the Company by which the Company agreed to relocate its tracks during the construction of that portion of the section, and for such purpose the Commission granted a temporary location on Old Colony avenue. Plans for the station at Broadway and for the terminal at Andrew square are still under consideration.

Details of the work for the year will be found in the report of the Chief Engineer.

Use of Part of the Tunnel.

Conferences were held with the Boston Elevated Railway Company as to the use of a portion of the tunnel before the whole was completed. Such use was authorized by Chapter 130 of the Special Acts of 1915, (Appendix C) and the Company expressed its willingness to equip and operate that portion of the tunnel from Park street east, including Washington station (extending to Chauncy street) as soon as it was ready. A contract was executed with the Company for the use of that portion of the tunnel, no rental therefor being charged, in consideration of the fact that the Company would be put to considerable expense in equipment and maintenance, with little or no added return in the way of traffic. That portion was opened to public use April 14, 1915.

It is hoped that the tunnel can be opened for public travel as far as the South Station in about six months.

Enlargement of Park Street Station.

In connection with the construction of the Dorchester tunnel the Commission was authorized to enlarge the Park street station in the Tremont street subway. This work, which was necessarily slow in its progress on account of the difficulty of maintaining the traffic without interruption and the fact that the various steps of the work had to be taken consecutively instead of being done simultaneously, is now completed.

Details of the dimensions and arrangement of the enlarged station will be found in the report of the Chief Engineer.

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Enlarged Powers of the Commission.

A bill introduced into the Legislature to give the Commission additional powers in the construction of stations was passed by that body, being Chapter 376, Special Acts of 1915 (Appendix H). This Act was to take effect upon acceptance by the City Council of Boston approved by the Mayor, and by the Boston Elevated Railway Company, by its Board of Directors, and the filing of such acceptances with the Secretary of the Commonwealth. These acceptances were filed June 14th and 16th.

EAST BOSTON TUNNEL EXTENSION.

Little work remains to be done upon the East Boston Tunnel extension. Details will be found in the report of the Chief Engineer.

TREMONT STREET SUBWAY.

Upon the erection of a theater upon the old Winthrop school lot the owners petitioned for the closing of the opening in the sidewalk at Tremont street near Eliot street, which was an outlet for the ventilating chamber at that point. The Commission, however, had no authority to expend any further sums for account of the Tremont street subway. The situation was relieved by the passage by the Legislature of Chapter 87, Special Acts of 1915, (Appendix B) which was accepted by the Boston Elevated Railway Company. Under that Act the Commission has paid the cost of the relocation of the ventilating shaft, charging it in to the cost of the Tremont street subway, and the proprietors of the land upon which the theater is erected have given to the City an easement in their property for the location of the shaft.

REAL ESTATE.

Settlements for lands taken for various departments of work of the Commission have been made, as follows:

BOYLSTON STREET SUBWAY.

356 Newbury street	Elizabeth A. Mason

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EAST BOSTON TUNNEL EXTENSION.

91 Cambridge street	Mary E. Jones
79– 87 " "	A. E. Chadbourne
117–143 " "	Wm. K. Porter estate
161–171 " "	G. P. Federhen et als.

CAMBRIDGE CONNECTION.

61 Mt. Vernon street	Louis Cabot
2 Joy street	Francis C. Welch et als., Trs.
34 Beacon street	Charles W. Allen et als.
30 Beacon street	James M. Beebe Hrs.

On February 11, 1915, the unused portion of the estate formerly belonging to Georgianna P. and Herbert M. Federhen et als. on Cambridge street, taken for the purposes of the East Boston Tunnel extension, was sold to Bertha E. Arseno for $7,000.

LEGISLATION.

The General Court of 1915 has passed the following relating to the work of the Commission, all being special acts:

Chapter 87	Alterations in Tremont street subway.	Appendix B
" 130	Permitting the use of part of the Dorchester tunnel before the completion of the whole.	Appendix C
" 184	Abolition of tolls in East Boston Tunnel.	Appendix D
" 270	Compensation to injured workmen.	Appendix E
" 293	Construction of the subway in Charlestown and removal of the elevated structure.	Appendix F
" 297	Station at Arlington street on the Boylston street subway.	Appendix G
" 376	Connections at stations with surface lines.	Appendix H

CHARLESTOWN ELEVATED STRUCTURE AND SUBWAY.

Chapter 293, Special Acts of 1915, (Appendix F) directed the Commission, under certain conditions, to construct a subway in Charlestown from Sullivan square to City square and after the construction of such subway the elevated structure is to be removed.

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The following correspondence has taken place between the Boston Elevated Railway Company and the Commission:

June 1, 1915.

Boston Elevated Railway Co., GEN. WM. A. BANCROFT, *President.*

MY DEAR SIR:—I beg leave to call your attention to Chapter 293 of the Acts of 1915, providing for the construction of a tunnel or subway in Charlestown.

Section 1 of this act reads as follows:

"The Boston transit commission shall construct a tunnel or subway from a point at or near City square to a point at, near or beyond Sullivan square in the Charlestown district of the city of Boston, under the same provisions as to construction, payment and use that are provided by law for the construction, payment and use of the present tunnel under Washington street in the city of Boston."

You will observe that this act *requires* the Transit Commission to construct a subway, under certain terms and conditions, with which you are familiar. This Commission will be glad to be informed as to the attitude of your Company with regard to this matter.

Yours very truly,

(Signed) GEORGE F. SWAIN,
Chairman.

BOSTON ELEVATED RAILWAY COMPANY
SECRETARY'S OFFICE.
101 MILK ST.

BOSTON, MASS., June 14, 1915.

PROF. GEORGE F. SWAIN, *Chairman, Boston Transit Commission*, 15 *Beacon street, Boston, Massachusetts.*

DEAR SIR:—This will serve to inform you that at a Special Meeting of the Board of Directors of the Boston Elevated Railway Company, duly called and held this day, at eleven-thirty A. M., a quorum being present, the following vote was unanimously adopted:

> VOTED: That the Boston Elevated Railway Company take no action with reference to the provisions of Chapter 293 of the Special Acts of 1915, entitled 'An Act to Provide for the Construction of a Tunnel or Subway in the Charlestown District of the City of Boston and the Removal of the Elevated Railway Structure in Said District,' and that the Clerk be authorized to communicate this vote to the Boston Transit Commission.

Very truly yours,

(Signed) D. L. PRENDERGAST,
Clerk pro tem.

BOSTON TRANSIT COMMISSION.
15 BEACON STREET.

BOSTON, June 22, 1915.

Boston Elevated Railway Co., WILLIAM A. BANCROFT, *President.*

GENTLEMEN:—I am directed by the Commission to ask if the Company will enter into a contract with the city of Boston through this Commission for the use and occupation of the tunnel provided for by chapter

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293 of the special acts of 1915, on the payment of an annual rental equal to four and one-half per cent. of the cost of said tunnel, as said cost is defined in said chapter 293, reading the first four sections together.

Yours respectfully,

(Signed) B. LEIGHTON BEAL,
Secretary.

TEAMING TUNNEL TO EAST BOSTON.

The following correspondence has taken place between His Honor, the Mayor, and the Commission in relation to a teaming tunnel to East Boston:

CITY OF BOSTON
OFFICE OF THE MAYOR

November 19, 1914.

GEORGE F. SWAIN, *Chairman, Boston Transit Commission, Boston, Mass.*

MY DEAR SIR:—In connection with the development of the transportation facilities of Boston, I am of the opinion that it would be advisable for your Board to make a study as to the advisability, necessity and cost of establishing a teaming and pedestrian traffic tunnel between Boston and East Boston.

With a system of elevators connecting the street surface with the bed of the tunnel, it might be possible to establish such physical connection between Boston and East Boston as will result in the proper commercial development of East Boston.

The present cost of maintenance of the ferry service by the Municipality is ample to cover a five million dollar bond issue annually and if a teaming and pedestrian traffic tunnel were established at a cost of less than three millions of dollars, it might be possible for the City to finance the same, discontinuing the ferries, and effecting a saving of approximately $50,000 annually, in addition to furnishing better service to a section of Boston where the very best commercial opportunities are today neglected because of the lack of proper physical connection.

Respectfully yours,

(Signed) JAMES M. CURLEY,
Mayor.

BOSTON TRANSIT COMMISSION,
15 BEACON STREET,

BOSTON, November 24, 1914.

HONORABLE JAMES M. CURLEY, *Mayor, City of Boston.*

MY DEAR SIR:—I beg leave to acknowledge on behalf of the Commission the receipt of your communication of the 19th, relating to the construction of a teaming tunnel between Boston and East Boston, and asking the Commission to consider the question of constructing such a tunnel.

I beg leave to state that this Commission has on two occasions given consideration to this question and I transmit to you herewith copies of the fourteenth and seventeenth annual reports of the Commission in which you will find reports on this subject.

The first report, made in 1908, was in connection with the investigation of the Commission on congestion of traffic. The reference to the teaming tunnel to East Boston will be found on pages 72, 76, 77, 78 and 79.

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The report made in 1911 was in response to a resolve of the legislature and will be found in appendix J, pages 116 to 121. In this report the previous report, made in 1908, is quoted almost in full.

You will note that the Commission has made designs and estimates for such a tunnel. The estimated cost will be found in the report of 1911.

Probably the two important questions relating to the proposition to construct such a tunnel are, 1—would such a tunnel enable the city to abandon the ferries, and 2—is such a tunnel desirable as a means of promoting traffic between Boston and East Boston and furthering the development of the latter section.

This Commission has definitely stated the opinion that the building of such a tunnel would not do away with the necessity of operating the ferries and it further came to the conclusion in its last report that "with a large use of animal power the construction of a teaming tunnel would be inadvisable."

It is to be borne in mind that such a tunnel would in itself involve a considerable expense for maintenance, including lighting, draining, ventilating, the operation of elevators, and cleaning. The sanitary question, especially with large use of animal power, is an important consideration.

You will note from the report of the Commission certain interesting facts relating to the tunnel under the harbor at Glasgow, which was built at a cost of $1,450,000 and the operation of which has been discontinued.

After looking over these reports, if there is any further investigation which Your Honor would like to have this Commission make, the Commission would be glad to undertake any investigations which do not require the expenditure of funds, as it has no appropriation available except for the construction of the subways now authorized.

Respectfully yours,

(Signed) GEORGE F. SWAIN,
Chairman.

WORK FOR UNEMPLOYED.

The following is the correspondence between His Excellency, the Governor, and the Commission in relation to the unemployed:

THE COMMONWEALTH OF MASSACHUSETTS,
EXECUTIVE DEPARTMENT,

BOSTON, January 26, 1915.

MR. GEORGE F. SWAIN, *Chairman Boston Transit Commission, 15 Beacon street, Boston.*

DEAR SIR:—As you are undoubtedly informed through the public press, I have recently called to my aid a representative group of Massachusetts men and women in an organization designated the "State Committee on Unemployment." I bespeak for this Committee and its work the cheerful co-operation of every State board and the head of every State department.

The especial object of the State Committee on Unemployment is to find work that may be done in the next few months. I write to you today to know what you can do to help us. What work has been outlined in your department, which will in any event be done some time in the course of the present year, which *can* be done immediately, or at all events within the next thirty, sixty or ninety days?

What I have in mind, of course, is such work as will call for additional or outside help, which will, in a word, give some of our deserving fellow

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A bronze tablet has been erected at the Public Library entrance to the Copley station, Boylston street subway, bearing the following inscription:

THE BOYLSTON STREET SUBWAY
AUTHORIZED BY THE LEGISLATURE—1911
EUGENE N. FOSS—GOVERNOR
JOHN F. FITZGERALD—MAYOR OF BOSTON
OPENED TO PUBLIC TRAVEL—OCTOBER 3, 1914

BUILT BY THE BOSTON TRANSIT COMMISSION
GEORGE G. CROCKER—CHAIRMAN TO MAY 26, 1913
GEORGE F. SWAIN—CHAIRMAN FROM JUNE 2, 1913
HORACE G. ALLEN JOSIAH QUINCY
JAMES B. NOYES DAVID A. ELLIS
MR. CROCKER DIED MAY 26, 1913

EDMUND S. DAVIS—CHIEF ENGINEER

EAST BOSTON TUNNEL.

Toll Receipts.

The following is a statement of the receipts from tolls and the cost of collection of the same for the year ending June 30, 1915:

July 1, 1914, to July 31, 1914:		
Receipts	$13,704 67	
Cost	1,970 16	
		$11,734 51
August 1, 1914, to October 31, 1914:		
Receipts	$41,702 42	
Cost	5,897 12	
		35,805 30
November 1, 1914, to January 31, 1915:		
Receipts	$40,591 52	
Cost	5,690 69	
		34,900 83
February 1, 1915, to April 30, 1915:		
Receipts	$38,767 95	
Cost	5,464 07	
		33,303 88
May 1, 1915, to June 30, 1915:		
Receipts	$26,263 98	
Cost	3,693 89	
		22,570 09
		$138,314 61

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SINKING FUNDS.

The following is the condition of the debt and of the sinking funds for the various divisions of the work of the Commission at the date of this report, as stated by the City Treasurer:

SUBWAY (INCLUDING ALTERATIONS.)

(Debt, $4,416,000, outside debt limit.)

Amount of fund, July 1, 1914		$1,611,771 82
Interest on bank deposits, July 1, 1914, to date	$2,334 47	
Interest on investments, July 1, 1914, to date	52,556 66	
Revenue, etc., July 1, 1914, to date	34,939 00	
		89,830 13
		$1,701,601 95

CHARLESTOWN BRIDGE, No. 1.

(Debt, $750,000, inside debt limit.)

Amount of fund, July 1, 1914		$233,901 48
Interest on bank deposits, July 1, 1914, to date	$1,488 80	
Interest on investments, July 1, 1914, to date	6,458 75	
Requirement for debt	7,643 00	
		15,590 55
		$249,492 03

CHARLESTOWN BRIDGE, No. 2.

(Debt, $805,000, outside debt limit.)

Amount of fund, July 1, 1914		$267,573 25
Interest on bank deposits, July 1, 1914, to date	$1,721 40	
Interest on investments, July 1, 1914, to date	5,981 43	
Revenue, etc., July 1, 1914, to date	1,265 07	
Requirement for debt	5,630 00	
		14,597 90
		$282,171 15

EAST BOSTON TUNNEL.

(Debt, $3,258,000, outside debt limit.)

Amount of fund, July 1, 1914		$680,433 85
Interest on bank deposits, July 1, 1914, to date	$283 81	
Interest on investments, July 1, 1914, to date	25,254 28	
Revenue, etc., July 1, 1914, to date	101,420 85	
		126,958 94
		$807,392 79

BOSTON TUNNEL AND SUBWAY.

(Washington Street Tunnel.)

(Debt, $8,466,700, outside debt limit.)

Amount of fund, July 1, 1914		$794,306 40
Interest on bank deposits, July 1, 1914, to date	$335 46	
Interest on investments, July 1, 1914, to date	33,877 00	
Revenue, etc., July 1, 1914, to date	78,924 74	
		113,137 20
		$907,443 60

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RAPID TRANSIT—CAMBRIDGE CONNECTION.

(Debt, $1,450,000, outside debt limit.)

Amount of fund, July 1, 1914		$57,866 17
Interest on bank deposits, July 1, 1914, to date	$319 75	
Interest on investments, July 1, 1914, to date	1,470 00	
Revenue, etc., July 1, 1914, to date	14,541 31	
		16,331 06
		$74,197 23

BOYLSTON STREET SUBWAY.

(Formerly Riverbank Subway.)

(Debt, $4,842,000, outside debt limit.)

Amount of fund, July 1, 1914		$1,500 28
Interest on bank deposits, July 1, 1914, to date	$14 96	
Interest in investments, July 1, 1914, to date	35 00	
		49 96
		$1,550 24

DORCHESTER TUNNEL.

(Debt, $5,150,000, outside debt limit.

EAST BOSTON TUNNEL EXTENSION.

(Debt, $2,450,000, outside debt limit.)

RENTALS PAID BY THE BOSTON ELEVATED RAILWAY COMPANY.

The following is a statement of the bills rendered for rental of the various tunnels and subways and the amounts paid thereon:

Tremont Street Subway.

Sept. 30, 1914:		
Net cost of subway	$4,100,955 72	
One quarter's rental		$49,980 40
Alterations: net cost	242,673 93	
One quarter's rental		2,957 59
Dec. 31, 1914:		
Net cost of subway	4,100,955 72	
One quarter's rental		49,980 40
Alterations: net cost	242,673 93	
One quarter's rental		2,957 59
March 31, 1915:		
Net cost of subway	4,100,955 72	
One quarter's rental		49,980 40
Alterations: net cost	242,673 93	
One quarter's rental		2,957 59
June 30, 1915:		
Net cost of subway	4,103,482 70	
One quarter's rental		50,011 20
Alterations: net cost	242,673 93	
One quarter's rental		2,957 59
Total		$211,782 76

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Washington Street Tunnel.

Sept. 30, 1914:		
Net cost of tunnel	$7,895,138 56	
Rental for one quarter		$88,820 31
Dec. 31, 1914:		
Net cost of tunnel	7,901,274 75	
Rental for one quarter		88,889 34
March 31, 1915:		
Net cost of tunnel	7,901,274 75	
Rental for one quarter		88,889 34
June 30, 1915:		
Net cost of tunnel	7,901,281 45	
Rental for one quarter		88,889 42
Total		$355,488 41

Cambridge Connection.

Sept. 30, 1914:		
Net cost of connection	$1,451,731 61	
One quarter's rental		$17,692 98
Dec. 31, 1914:		
Net cost of connection	1,451,759 66	
One quarter's rental		17,693 32
March 31, 1915:		
Net cost of connection	1,455,259 66	
One quarter's rental		17,735 98
June 30, 1915:		
Net cost of connection	1,455,274 15	
One quarter's rental		17,736 15
Total		$70,858 43

Boylston Street Subway.

Dec. 31, 1914:		
Net cost of subway	$4,403,450 33	
*Rental for two months and twenty-nine days		$48,769 72
March 31, 1915:		
Net cost of subway	4,485,093 70	
One quarter's rental		50,457 31
June 30, 1915:		
Net cost of subway	4,547,083 68	
One quarter's rental		51,154 69
Total		$150,381 72

* Opened for use October 3, 1914.

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STATEMENT OF EXPENSES.

The following is a classified statement of the expenses of the Commission for the year ending June 30, 1915:

SUBWAY.

SECTION FOUR.

Alterations		$2,526 98

EAST BOSTON TUNNEL.

ENGINEERING DEPARTMENT.

Skilled service		514 42

SECTION B.

Construction	$674 93	
Field supplies	1,411 01	
Labor	10,036 21	
Office supplies	48 77	
Skilled service	1,171 80	
Teaming	25 15	
		13,367 87

SECTION C.

Legal and expert advice		10 00

BOSTON TUNNEL AND SUBWAY.

SECTION TWO.

Paving		10 14

SECTION FOUR.

Legal and expert advice	$10 00	
Property Damages: Takings	6,073 80	
Winter street entrance	2 18	
		6,085 98

SECTION SEVEN.

Legal and expert advice		42 25

SECTION NINE.

Labor		4 52

CAMBRIDGE CONNECTION.

ENGINEERING DEPARTMENT.

Skilled service		5 86

SECTION ONE.

Property Damages: Takings		8,178 05

SECTION TWO.

Construction	$154 49	
Stationery-supplies	20	
Teaming	11 09	
		165 78
Carried forward		$30,911 85

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Brought forward		$282,465 67

SECTION B.

(*From about the west line of Washington street, under Washington and Summer streets, to a point about 50 feet east of the east line of Arch street.*)

Hugh Nawn Contracting Co. (Contract 457)	$84,888 38	
Boston Bridge Works (Contract 445)	18 48	
Otis Elevator Co. (Contract 478)	24,304 76	
Keith & Craffey (Contract 527)	9,821 22	
Penna. Tile and Construction Co. (Contract 529)	1,582 94	
DePaoli Mosaic Assn. (Contract 536)	9,007 12	
E. B. Badger & Sons Co. (Contract 541)	1,453 50	
A. Williams & Co. (Contract 543)	3,582 04	
Jas E. Nelson Co. (Contract 544)	8,850 00	
O. H. Drisko & Son (Contract 547)	1,820 07	
Advertising	144 78	
Alterations	5,549 92	
Construction	21,195 63	
Damages	5,687 27	
Field supplies	706 26	
Fuel	35 50	
Inspection	16 66	
Labor	11,594 79	
Legal and expert advice	895 00	
Lighting	2,410 05	
Paving	1,439 10	
Printing	34 50	
Skilled service	3,056 95	
Stationery-supplies	171 53	
Teaming	210 04	
Telephone-telegraph	103 04	
Testing	297 51	
Tools	238 82	
Water pipes	353 04	
	$199,468 90	
Credit:		
Property Damages: Takings	6,126 82	
		193,342 08

SECTION C.

(*Located in Summer street and extends from near Arch street to Dewey square, a distance of about* 1,018 *linear feet.*)

James J. Coughlan Co. (Contract 485)	$199,668 20	
Advertising	7 20	
Alterations	751 46	
Construction	48,783 76	
Damages	435 08	
Field Supplies	25 94	
Furniture	3 75	
Inspection	460 38	
Instruments	45 63	
Insurance	61 50	
Labor	7,320 43	
Lighting	194 63	
Paving	48 38	
Rental	562 50	
Skilled service	5,587 41	
Stationery-supplies	130 42	
Teaming	8 17	
Carried forward	$264,094 84	$475,807 75

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Brought forward	$264,094 84	$475,807 75
Telephone-telegraph	63 34	
Testing	93 44	
Tools	91 92	
Water pipes	4,487 23	
		268, 830 77

SECTION D.

(*Located in Dewey square and Summer street and has a length of about* 800 *linear feet. It includes a two-platform station with a lobby over the tracks, a pump well, elevator shafts and stairways.*)

Hugh Nawn Contracting Co. (Contract 523)	$477,208 38	
Boston Bridge Works (Contract 445)	60 00	
Carnegie Steel Co. (Contract 515)	5,516 43	
Bethlehem Steel Co. (Contract 516)	20,538 88	
Advertising	102 30	
Construction	57,715 78	
Field supplies	488 49	
Fuel	176 95	
Furniture	33 50	
Inspection	1,148 68	
Instruments	97 45	
Labor	29,607 52	
Legal and expert advice	26 50	
Lighting	1,414 65	
Printing	229 25	
Rental	710 70	
Skilled service	9,101 14	
Stationery-supplies	219 33	
Teaming	103 26	
Telephone-telegraph	95 50	
Test pits	223 34	
Testing	218 31	
Tools	2,122 92	
Water pipes	952 39	
		608,111 65

SECTION E.

(*Under and near the Fort Point Channel, from a point in Summer street about* 200 *feet west of the Channel to about 80 feet north of the corner of West Second street and Dorchester avenue, South Boston, and having a length of about* 3,000 *feet.*)

P. McGovern & Co. (Contract 538)	$139,639 45	
Advertising	195 83	
Construction	14,816 96	
Field Supplies	476 81	
Furniture	15 00	
Instruments	38 38	
Labor	2,758 00	
Legal and expert advice	30 00	
Lighting	37 91	
Printing	307 00	
Rental	66 67	
Skilled service	2,498 40	
Stationery-supplies	122 03	
Teaming	8 43	
Telephone-telegraph	29 06	
Testing	391 61	
Tools	35 73	
Water pipes	39 19	
		161,506 46
Carried Forward		$1,514,256 63

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Brought forward		$1,514,256 63

SECTION F.

(*Broadway station, in Dorchester avenue between Broadway and Dover street.*)

Stationery-supplies		8 73

SECTION H.

(*In Dorchester avenue between Old Colony avenue and Woodward street, and having a length of about 2,200 feet.*)

T. A. Gillespie Co. (Contract 550)	$47,760 15	
Advertising	145 40	
Construction	4,695 24	
Field supplies	293 31	
Fuel	17 90	
Furniture	4 45	
Inspection	261 63	
Instruments	35	
Labor	2,116 44	
Lighting	113 71	
Paving	12 00	
Printing	193 75	
Skilled service	742 36	
Stationery-supplies	83 50	
Teaming	73 46	
Telephone-telegraph	11 58	
Testing	3,258 76	
Tools	210 74	
		59,994 73

BOYLSTON STREET SUBWAY.

Office Expenses:			
Lighting		$12 85	
Printing		17 50	
Rental		500 00	
Stationery-supplies		126 54	
Telephone-telegraph		296 33	
Messenger		322 14	
Stenographers		1,563 80	
Salaries of Commissioners and Secretary		7,125 00	
		$9,964 16	
Transferred to Dorchester Tunnel	$3,321 39		
Transferred to East Boston Tunnel Extension	3,321 39		
		6,642 78	
		$3,321 38	
Items chargeable directly to Boylston street subway:			
Printing		112 00	
Stationery-supplies		15 00	
			3,448 38
Engineering Expenses:			
Advertising		$2 55	
Chief Engineer		750 00	
Clerks		456 34	
Field Supplies		213 69	
Carried Forward		$1,422 58	$1,577,708 47

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Brought forward	$1,422 58	$1,577,708 47
Instruments	26 10	
Labor	573 90	
Legal and expert advice	492 70	
Lighting	114 55	
Messengers	73 83	
Printing	329 25	
Rental	791 67	
Skilled service	9,382 12	
Stationery-supplies	455 10	
Stenographers	1,094 26	
Telephone-telegraph	43 40	
Testing	13 09	
Tools	66 08	
	$14,878 63	
Credit: Stock transferred to various sections	2,667 85	
		12,210 78

SECTION ONE.

(*From the easterly side of Kenmore street through Commonwealth avenue, the Fens, and Newbury street to the middle of Massachusetts avenue.*)

Hugh Nawn Contracting Company (Contract 427)	$19,526 53	
Construction	1,856 78	
Damages	1,050 00	
Field supplies	80 81	
Labor	625 16	
Legal and expert advice	15 00	
Lighting	502 22	
Paving	137 33	
Skilled service	34 80	
Stationery-supplies	32 10	
Teaming	19 30	
Tools	14 38	
Water pipes	399 21	
		24, 293 62

SECTION TWO.

(*From the middle of Massachusetts avenue, under private property and Boylston street, to the easterly line of Hereford street.*)

Hugh Nawn Contracting Company (Contract 427)	$45,083 41	
Hugh Nawn Contracting Company (Contract 432)	3,212 01	
Hugh Nawn Contracting Company (Contract 484)	2,463 04	
Hugh Nawn Contracting Company (Contract 491)	66 05	
Hugh Nawn Contracting Company (Contract 517)	3,850 23	
Gleason & Berry (Contract 504)	444 63	
Galassi Mosaic & Tile Company (Contract 509)	4,192 08	
Robert Gallagher Co. (Contract 510)	3,904 94	
E. Van Noorden & Co. (Contract 519)	1,102 26	
O. H. Drisko & Son (Contract 526)	1,584 79	
James Doherty (Contract 530)	3,663 23	
Carried forward	$69,566 67	$1,614,212 87

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Brought forward	$69,566 67	$1,614,212 87
Advertising	17 69	
Alterations	405 09	
Construction	10,469 35	
Field supplies	214 82	
Fuel	7 23	
Labor	1,058 92	
Legal and expert advice	150 00	
Lighting	589 98	
Paving	19 20	
Printing	7 50	
Property Damages: Takings	8,000 00	
Skilled service	1,032 93	
Stationery-supplies	140 00	
Teaming	52 24	
Telephone-telegraph	41 64	
Tools	107 72	
Water pipes	224 56	
		92,105 54

SECTION THREE.

(*From the easterly line of Hereford street, under Boylston street to the westerly end of the Public Library.*)

Hugh Nawn Contracting Company (Contract 432)	$5,416 34	
Advertising	97	
Construction	249 71	
Field supplies	54 40	
Labor	12 35	
Lighting	284 56	
Skilled service	21 90	
		6,040 23

SECTION FOUR.

(*From the westerly end of the Public Library, under Boylston street, to about the center of Arlington street.*)

Hugh Nawn Contracting Company (Contract 453)	$94,307 17	
Hugh Nawn Contracting Company (Contract 491)	798 03	
Hugh Nawn Contracting Company (Contract 517)	3,072 29	
Gleason & Berry (Contract 504)	421 98	
Hecla-Winslow Company (Contract 506)	9,840 05	
Robert Gallagher Company (Contract 510)	3,447 57	
Waldo Bros. (Contract 511)	3,412 38	
Coleman Bros. (Contract 513)	70,752 93	
W. A. & H. A. Root, Inc. (Contract 518)	7,300 00	
E. Van Noorden & Co. (Contract 519)	620 45	
The T. F. McGann & Sons Co. (Contract 525)	3,071 00	
O. H. Drisko & Son (Contract 526)	1,135 23	
Advertising	35 94	
Construction	22,994 81	
Damages	97 29	
Field supplies	90 79	
Furniture	2 25	
Inspection	40 47	
Instruments	5 71	
Labor	2,407 60	
Carried forward	$223,853 94	$1,712,358 64

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Brought forward	$223,853 94	$1,712,358 64
Legal and expert advice	1,250 18	
Lighting	557 59	
Paving	459 51	
Skilled service	974 81	
Stationery-supplies	91 92	
Teaming	5 63	
Telephone-telegraph	30 27	
Tools	207 35	
Water pipes	2,861 35	
		230,292 55

SECTION FIVE.

(*Located in Boylston street and extends from Arlington street to about* 30 *feet east of Carver street, a distance of about* 1,050 *feet.*)

Hugh Nawn Contracting Company (Contract 471)	$178,339 79	
Hugh Nawn Contracting Company (Contract 491)	120 86	
Hugh Nawn Contracting Company (Contract 517)	990 56	
Simpson Bros. Corp. (Contract 512)	3,275 23	
Advertising	6 05	
Alterations	1,810 38	
Construction	31,117 81	
Damages	50 00	
Field supplies	160 42	
Inspection	503 53	
Instruments	3 55	
Labor	3,163 21	
Legal and expert advice	50 00	
Lighting	211 38	
Paving	6,443 05	
Skilled service	1,566 93	
Stationery-supplies	94 36	
Teaming	10 25	
Telephone-telegraph	38 74	
Testing	8 17	
Tools	29 85	
Water pipes	1,620 97	
		229,615 09

EAST BOSTON TUNNEL EXTENSION.

Office Expenses:		
Printing	$60 00	
Proportion of general expenses, transferred from Boylston street subway	3,321 39	
Proportion of general expenses, transferred from Dorchester tunnel	10,750 96	
		14,132 35
Engineering Expenses:		
Isaac Blair & Co. Inc. (Contract 448)	$169,348 08	
Advertising	8 47	
Cambridge street widening: Miscellaneous,	42,747 64	
Chief Engineer	2,875 00	
Clerks	2,020 89	
Construction	128 58	
Field supplies	88 74	
Carried forward	$217,217 40	$2,186,398 63

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Brought forward	$217,217 40	$2,186,398 63
Fuel	28 30	
Instruments	39 29	
Legal and expert advice	502 40	
Lighting	27 94	
Messengers	98 31	
Printing	396 33	
Rental	1,400 01	
Skilled service	15,873 99	
Stationery-supplies	1,035 93	
Stenographers	1,626 34	
Telephone-telegraph	143 01	
Testing	14 47	
Tools	70 04	
	238,473 76	
Credit: Stock transferred to various sections,	667 64	
		237,806 12

SECTION G.

(*Changes in the Scollay square station and in the existing East Boston Tunnel and all new work from Washington street to Stoddard street.*)

Isaac Blair & Co. Inc. (Contract 529)	550 40	
DePaoli Mosaic Assn. (Contract 553)	2,346 31	
Boston Bridge Works (Contract 445)	168 13	
Advertising	6 05	
Alterations	1,356 60	
Construction	39,469 51	
Damages	1,405 53	
Field supplies	13,313 82	
Fuel	626 74	
Inspection	39 27	
Insurance	62 62	
Labor	13,175 50	
Legal and expert advice	50 00	
Lighting	9,699 66	
Paving	237 87	
Printing	6 25	
Skilled service	2,691 50	
Stationery-supplies	115 69	
Teaming	582 16	
Telephone-telegraph	135 84	
Testing	1 00	
Tools	649 64	
Water pipes	200 55	
		86,890 64

SECTION H.

(*All work from Stoddard street to Staniford street and including the Bowdoin station.*)

Coleman Bros. (Contract 494)	240,027 54	
Coleman Bros. (Contract 548)	1,539 22	
DePaoli Mosaic Assn. (Contract 552)	3,140 33	
Keith & Craffey (Contract 556)	1,365 30	
Advertising	10 70	
Alterations	5,291 73	
Carried forward	$251,374 82	$2,511,095 39

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Brought forward	$251,374 82	$2,511,095 39
Construction	67,082 97	
Damages	2,266 28	
Field supplies	855 41	
Fuel	57 80	
Inspection	821 50	
Instruments	14 20	
Labor	18,790 22	
Legal and expert advice	2,060 00	
Lighting	627 47	
Paving	1,058 94	
Rental	135 00	
Skilled service	5,812 50	
Stationery-supplies	184 94	
Stenographers	34 00	
Teaming	474 09	
Telephone-telegraph	109 69	
Testing	82 13	
Tools	475 02	
Water pipes	1,754 69	
		354,071 67

SECTION J.

(*All work west of Staniford street to North Russell street.*)

Coleman Bros. (Contract 473)	$19,617 31	
Coleman Bros. (Contract 514)	2,537 71	
Advertising	12 20	
Alterations	597 92	
Construction	1,564 88	
Damages	1,475 00	
Field supplies	40 78	
Inspection	127 15	
Labor	76 75	
Legal and expert advice	225 50	
Lighting	3 00	
Paving	99 03	
Property Damages: Takings	4,300 00	
Skilled service	770 62	
Stationery-supplies	87 85	
Telephone-telegraph	6 74	
Testing	5 19	
Tools	7 29	
Water pipes	54 94	
		31,609 86

CHAPTER 84—RESOLVES OF 1913.

Engineering Expenses	2 10

INTEREST.

Boston tunnel and subway	$2,993 76	
Dorchester tunnel	102,606 66	
Boylston street subway	158,211 25	
East Boston tunnel extension	62,515 56	
		326,327 23
Net increase		$3,223,106 25

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SUMMARY.

	From beginning of work to June 30, 1914.	June 30, 1914, to June 30, 1915.	Total.
Subway — Subway Commission	$14,131 16		$14,131 16
Part of General Expenses	117,550 71		117,550 71
Engineering and miscellaneous	407,475 48		407,475 48
Section One	239,407 12		239,407 12
Two	363,605 50		363,605 50
Three	300,639 36		300,639 36
Three and one-half	9,355 70		9,355 70
Four	469,620 33	$2,526 98	472,147 31
Five	388,955 49		388,955 49
Six	327,541 86		327,541 86
Seven	231,504 27		231,504 27
Eight	95,902 06		95,902 06
Eight and one-half	76,639 47		76,639 47
Nine	299,452 07		299,452 07
Ten	254,497 88		254,497 88
Eleven	270,310 57		270,310 57
Interest	258,575 60		258,575 60
	$4,125,164 63	$2,526 98	$4,127,691 61
Transfer to Alterations, see 11th report	4 95		4 95
Total	$4,125,159 68	$2,526 98	$4,127,686 66
Alterations—Part of General Expenses	$28,945 53		$28,945 53
Section Three	2,568 26		2,568 26
Four	163 42		163 42
Five	30,233 01		30,233 01
Seven	178,516 16		178,516 16
Nine	3 00		3 00
Ten	534 04		534 04
Interest	1,905 56		1,905 56
Transfer from Subway, see 11th report	4 95		4 95
Total	$242,873 93		$242,873 93
Charlestown Bridge: Total	$1,570,197 98		$1,570,197 98
Investigation of Congestion of Traffic, etc.: Total	$3,015 92		$3,015 92

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	From beginning of work to June 30, 1914.	June 30, 1914, to June 30, 1915.	Total
East Boston Tunnel—			
Part of General Expenses	$161,134 78		$161,134 78
Engineering Expenses	192,558 50	$514 42	193,072 92
Section A	98,869 09		98,869 09
B	1,403,058 30	13,367 87	1,416,426 17
C	508,192 77	10 00	508,202 77
D	246,554 26		246,554 26
E	188,303 27		188,303 27
F	243,793 42		243,793 42
Interest	248,156 88		248,156 88
Total	$3,290,621 27	$13,892 29	$3,304,513 56
Boston Tunnel & Subway—Part of General Expenses	$226,486 57		$226,486 57
Engineering Expenses	418,340 29		418,340 29
Section One	815,586 82		815,586 82
Two	641,713 50	$10 14	641,723 64
Three	683,832 90		683,832 90
Four	1,197,895 70	6,085 98	1,203,981 68
Five	1,080,023 84		1,080,023 84
Six	334,530 37		334,530 37
Seven	139,656 89	42 25	139,699 14
Eight	617,152 07		617,152 07
Nine	678,759 91	4 52	678,764 43
Ten	142,880 35		142,880 35
Eleven	345,493 91		345,493 91
Twelve	45,417 52		45,417 52
Interest	645,186 05	2,993 76	648,179 81
Total	$8,012,956 69	$9,136 65	$8,022,093 34
Cambridge Connection:			
Office Expenses	$62,355 20		$62,355 20
Engineering Expenses	97,148 35	$5 86	97,154 21
Section One	580,594 19	8,178 05	588,772 24
Two	623,393 46	165 78	623,559 24
Interest	76,722 00		76,722 00
Total	$1,440,213 20	$8,349 69	$1,448,562 89
Dorchester Tunnel:			
Office Expenses	$37,924 84	$28,553 03	$66,477 87
Engineering Expenses	294,370 19	219,580 78	513,950 97
Section A	401,096 53	3,420 01	404,516 54
B	886,566 65	193,342 08	1,079,908 73
C	126,867 05	268,830 77	395,697 82
D	1 40	608,111 65	608,113 05
E		161,506 46	161,506 46
F		8 73	8 73
H		59,994 73	59,994 73
Interest	76,813 32	102,606 66	179,419 98
Total	$1,823,639 98	$1,645,954 90	$3,469,594 88

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	From beginning of work to June 30, 1914.	June 30, 1914, to June 30, 1915.	Total.
Boylston Street Subway:			
Office Expenses	$67,656 79	$3,448 38	$71,105 17
Engineering Expenses	161,826 32	12,210 78	174,037 10
Section One	722,007 09	24,293 62	746,300 71
Two	837,242 69	92,105 54	929,348 23
Three	575,910 74	6,040 23	581,950 97
Four	1,206,665 32	230,292 55	1,436,957 87
Five	439,797 79	229,615 09	669,412 88
Interest	161,983 34	158,211 25	320,194 59
Total	$4,173,090 08	$756,217 44	$4,929,307 52
East Boston Tunnel Extension:			
Office Expenses	$17,176 83	$14,132 35	$31,309 18
Engineering Expenses	700,788 54	237,806 12	938,594 66
Section G	94,527 23	86,890 64	181,417 87
H	139,653 69	354,071 67	493,725 36
J	99,629 54	31,609 86	131,239 40
Interest	44,562 23	62,515 56	107,077 79
Total	$1,096,338 06	787,026 20	$1,883,364 26
Chapter 78—Resolves of 1913:			
Office Expenses	$ 37		$ 37
Engineering Expenses	388 77		388 77
	389 14		389 14
Chapter 84—Resolves of 1913:	$634 48	$2 10	$636 58
Dorchester Tunnel Extension	$520 19		$520 19
Grand Total	$25,779,650 60	$3,223,106 25	$29,002,756 85

The report of the Chief Engineer follows.

GEORGE F. SWAIN,
HORACE G. ALLEN,
JOSIAH QUINCY,
JAMES B. NOYES,
DAVID A. ELLIS,
Boston Transit Commission.

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REPORT OF THE CHIEF ENGINEER.

BOSTON, June 30, 1915.

GEORGE F. SWAIN, HORACE G. ALLEN, JOSIAH QUINCY, JAMES B. NOYES, DAVID A. ELLIS, *Boston Transit Commissioners.*

GENTLEMEN:—I beg leave to submit the following report in regard to work done in compliance with your instructions on the Dorchester Tunnel, the Enlargement of Park Street Station, the Boylston Street Subway and the East Boston Tunnel Extension, for the year ending June 30, 1915.

DORCHESTER TUNNEL.

The Dorchester Tunnel will have a length of about 12,000 linear feet. Of this length there are now 2,108 feet completed, and about 6,200 feet under contract. Detail plans are progressing for the remaining part. Nearly the entire length of the completed portion, which comprises Sections A, B, and C, is now in use. On April 4, 1915, the Washington station was opened for traffic and used as a temporary terminal for the Cambridge Subway trains. Until the completion of the station at Dewey square the southerly platform of the Washington station will be used only as an unloading platform, while the northerly platform will be used only as a loading platform.

To the east of the Washington station, in Section C, a cross-over is laid from the track for eastbound cars to the track for westbound cars, so that trains coming from Cambridge, after unloading passengers on the southerly platform, may return on the opposite track and take on passengers from the northerly platform.

SECTION B.

Construction Data.

Location and description of structures: A two-platform station with lobby above, and connections with the Washington Street Tunnel. The section extends under Summer street from Washington street to Arch street.

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Plates in previous reports and in this report: XIX., 5 and 6; XX., 2; XXI., 1.

Contractor, date of contract and amount of bid for construction of station proper: Hugh Nawn Contracting Company, March 31, 1913, $351,048.00. (Contract extended on June 24, 1914, to include entrance and exit at Chauncy street and exit at Hawley street.)

Date of beginning of work: April 1, 1913.

Date of certificate of completion: August 3, 1914.

Amount of work done under the contract: Excavation, about 51,248 cu. yds.; Old masonry removed, about 3,497 cu. yds.; Standard concrete placed, about 13,128 cu. yds.; Structural steel placed, about 919 tons; Steel rods used for reinforcing concrete, about 443 tons.

Number of men ordinarily employed by the contractor for construction during the progress of the work: Day, about 160; Night, about 82.

Character of earth found in excavation: Sand and clay.

Disposition of surplus earth: Some has been used for filling, in South Boston, and some has been teamed to scows and dumped at sea.

Contractor for building and erecting two double-file cleat type escalators and date of contract: Otis Elevator Company, November 11, 1913.

Contract price for both machines: $25,725.00.

Dates of satisfactory tests: Chauncy street escalator, March 16, 1915; Hawley street escalator, June 15, 1915.

Contractors for furnishing structural steelwork and dates of contracts: Boston Bridge Works, September 30, 1912; Bethlehem Steel Company, December 12, 1912.

Appendices in previous report and in this report showing bids: XIX., Y; XXI., R, V, W, Z, DD, EE, FF, GG, JJ and UU.

Assistant Engineer in charge of construction: G. D. Emerson.

A description of the interior finish of the Washington station is as follows: The ceilings and upper part of the walls of the station including the lobby are of white cement plaster. The lower part of the walls are of white polished terrazzo with a border of white and red ceramic tile and red terrazzo at the top between the white terrazzo and the plaster and also at the bottom between the white terrazzo and the granolithic base. A border of red and white ceramic tile is also carried around the advertising panels. The interior columns in the lobby are encased with concrete having a granolithic finish; those on the platform level of the station are finished with terrazzo and ceramic tile to correspond with the walls. See Plate 1.

At this station two double-file inclined elevators, or escalators, of the cleat type, one for each platform, have been installed and tested. These escalators carry the passengers from the platform level to the level of the surface of the street. The escalator from the platform for eastbound trains has a

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vertical lift of about 34 feet and lands the passengers at the Chauncy street sidewalk level, and adjacent to it, in property taken for the purpose. The escalator from the platform for westbound trains has a vertical lift of about 35 feet 3½ inches and lands the passengers at the Hawley street sidewalk level, and adjacent to it, in property taken for the purpose. The reason for taking private property for the location of these escalators was because of the narrow and congested sidewalks and streets in the vicinity.

Escalator Tests: Besides various electrical and temperature tests of the electric motors the escalators were subjected to an efficiency test under the maximum contract load. The Chauncy street escalator was subjected to a full load test by carrying passengers at the rate of 7,200 per hour at 140 pounds per passenger for three consecutive hours. This escalator is located near one of the stairways of the station and the men employed in the test could ride up on the escalator and readily walk down the stairs to ride up again and repeat this trip continuously during the test. With 336 men it was possible to keep the escalator continuously loaded with approximately its full specified load. The total load carried during the test was at the rate of 20,112 men at 153.9 pounds for three hours, or 1,031,745 pounds per hour. This exceeded the contract requirement by about 2.35 per cent. In the maximum hour the escalator carried at the rate of 7,573 men, or 1,165,484 pounds, which exceeds the contract requirement by about 15.63 per cent. In the maximum 20 minutes it carried at the rate of 7,782 men or 1,197,649 pounds per hour, exceeding the contract requirement by about 18.8 per cent.

During this test, readings were obtained from which the efficiency of the escalator at the contract load was determined to be 72 per cent., which exceeds the contract guarantee by 10 per cent. The efficiency is considered as the ratio between the horsepower used in lifting the men and the horsepower received over the feed wires at the control apparatus.

As the Hawley street escalator is not located near a stairway, it was impractical to make a three hours' full load test by a method similar to the one used at Chauncy street. The motor was tested under its maximum rated load. In the field the escalator was tested under a light load for a period of eight hours. During the last three hours of this period the escalator was loaded with varying loads to determine its efficiency under

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WASHINGTON STATION. LOBBY, LOOKING EASTERLY.

HELIOTYPE CO., BOSTON

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WASHINGTON STATION. PLATFORM LEVEL, LOOKING EASTERLY.

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the contract requirements. The efficiency in this case was found to be 67.5 per cent.

SECTION C.

Construction Data.

Location and description of structures: Section C is a two-track structure of reinforced concrete, extending under Summer street from the easterly line of Arch street to the westerly side of Dewey square, a length of 1,026 feet.

Plate in previous report: XX., 3.

Contractor for construction and date of contract: James J. Coughlan Company, December 20, 1913.

Amount of bid: $325,150.00.

Date of beginning of work: January 3, 1914.

Date of completion named in contract: December 31, 1914.

Date of certificate of completion: April 8, 1915. (Time extended on account of changes in plans.)

Amount of work done during the year ending June 30, 1915: Excavation, in open cut, about 6,172 cu. yds., in tunnel, about 14,199 cu. yds.; Old masonry removed, about 100 cu. yds.; Standard concrete placed, in open cut, about 2,178 cu. yds., in tunnel, about 6,208 cu. yds.; Cinder concrete placed, about 1,292 cu. yds.; Steel rods used for reinforcing concrete, about 447 tons.

Total amount of work done under the contract: Excavation, in open cut, about 17,400 cu. yds., in tunnel, about 22,713 cu. yds.; Old masonry removed, about 566 cu. yds.; Standard concrete placed, in open cut, about 4,833 cu. yds., in tunnel, about 8,866 cu. yds.; Cinder concrete placed, about 1,718 cu. yds.; Steel rods used for reinforcing concrete, about 669 tons.

Number of men ordinarily employed by the contractor for construction during the progress of the work: Day, about 150; Night, about 75.

Character of earth found in excavation: Hard mixture of sand and clay with occasional pockets of sand.

Disposition of surplus earth: Teamed to scows and dumped at sea.

Appendix in previous report and in this report showing bids: XX., W; XXI., UU.

Assistant Engineer in charge of construction: G. D. Emerson.

A description of Section C was given in the Twentieth Annual Report.

SECTION D.

Construction Data.

Location and description of structures: Section D is located in Dewey square and Summer street and extends from the end of Section C, at the westerly side of Dewey square, to about 155 feet west of the inter-

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section of Dorchester avenue and Summer street, a length of about 800 feet. It includes a two-platform station. The station is built of reinforced concrete and structural steel and the tunnel of reinforced concrete.
Contractor for construction of tunnel and station proper and date of contract: Hugh Nawn Contracting Company, August 20, 1914.
Amount of bid: $673,780.00.
Date of beginning of work: August 25, 1914.
Date of completion named in contract: July 7, 1915.
Amount of work done to and including June 30, 1915: Excavation, in open cut, about 58,200 cu. yds., in tunnel, about 9,281 cu. yds.; Old masonry removed, about 791 cu. yds.; Standard concrete placed, in open cut, about 9,350 cu. yds., in tunnel, about 2,638 cu. yds.; Cinder concrete placed, about 1,348 cu. yds.; Steel rods used for reinforcing concrete, about 675 tons; Structural steel placed, about 969 tons; Steel sheet piling driven, about 140 tons.
Number of men ordinarily employed by the contractor for construction from beginning of work to and including June 30, 1915: Day, about 302; Night, about 183.
Character of earth found in excavation: Filling, soft mud, then stiff blue clay and hard sandy clay.
Disposition of surplus earth: Teamed to scows and dumped at sea.
Contractor for building and erecting two double-file ascending cleat type escalators, with each file independently driven and mounted on one truss, and two single-file reversible cleat type escalators: Otis Elevator Company.
Date of Contract: February 9,1915.
Contract price for the four machines: $55,300.00.
Appendices in this report showing bids: O and P.
Assistant Engineer in charge of construction: G. D. Emerson.

The station at Dewey square is similar to the Washington station in design and method of construction. It is being built by the open cut method. It is a two-story structure, with lobby for ticket offices and general distribution of traffic above, and two side platforms, each 350 feet long, and the tracks below. The lobby will connect with the street by four stairways, one on each side of Summer street east of Dewey square, one at the southwest corner of Summer street and Atlantic avenue and one on the northerly side of Summer street near the junction of Federal street. In addition, two single-file cleat type escalators, side by side, either of which may be run up or down, will connect the lobby with the sidewalk at the northerly side of the South station.

The lobby is connected with each platform by two stairways. Passengers leaving the station from the platform for eastbound cars will be served by a double-file ascending cleat type escalator running to the sidewalk in Atlantic avenue on the westerly

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side of the South station. A similar escalator will run from the platform for westbound cars to the sidewalk at the junction of Federal street with Summer street.

In the course of the work two columns of the Atlantic avenue elevated railway structure near the center of Dewey square had to be temporarily supported on beams and posts while the earth below was excavated and the portion of the tunnel station immediately below them was being built, after which their load was transferred on to the tunnel roof.

The part of the tunnel east of the station which is included in this contract is being built by drift methods.

A single arch section for two tracks, with crossovers from one track to the other, extends 176 feet easterly from the station, and from the end of the single arch section two separate tunnels, each for one track, are being constructed about 256 feet further, to the end of Section D.

SECTION E.

Construction Data.

Location and description of structures: Section E includes two single track circular tunnels. It begins near the intersection of Summer street and Dorchester avenue and extends under the Fort Point Channel and private property to a point near Dorchester avenue between West First street and West Second street, South Boston, a length of about 3,200 feet.

Plates in this report: 2 and 3.

Contractor and date of contract: P. McGovern & Company, December 16, 1914.

Amount of bid: $1,955,375.00.

Date of beginning of work: Work started on main shaft in West First street, January 6, 1915.

Date of completion named in contract: October 1, 1916.

Amount of work done to and including June 30, 1915: Excavation by shield method, about 4,584 cu. yds.; Excavation in shaft and tunnels without shield, about 11,500 cu. yds.; Concrete placed in shield tunnels, about 884 cu. yds.; Concrete placed in shaft and tunnels built without shield, about 1,947 cu. yds.; Long leaf pine used for tunnel lining, about 166,000 ft. B. M.

Number of men ordinarily employed by the contractor from beginning of work to and including June 30, 1915: Day, about 170; Night, about 67.

Character of earth found in excavation: Medium stiff blue clay.

Disposition of surplus earth: Delivered to scows and dumped at sea.

Appendix in this report showing bids: BB.

Assistant Engineer in charge of construction: G. D. Emerson.

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A main working shaft has been located in West First street, from which two parallel circular single track tunnels are being driven northerly about 3,000 feet into Summer street, by means of circular shields, which are 24 feet 4½ inches in diameter and 12½ feet long. Each shield weighs about 83 tons, not including the hydraulic jacks and other equipment. In each shield there are 24 jacks, each 8 inches in diameter, with 34-inch stroke, and working with a maximum pressure of 5,000 pounds per square inch. The tunnel work will be done in compressed air. The method of operation is as follows: The earth is dug from the heading for about 20 inches in front of the shield, which is then shoved ahead this same amount by means of the hydraulic jacks which react against an outer circular lining, 9 inches thick, made from long leaf pine lumber. This lining is built up of annular segments, 4 feet 8 inches long and 9¾ inches wide, sawed accurately to shape and placed in the rear of the shield as the excavation progresses. The segments are fastened together, when in place, by steel pins. Plate 2 shows the work at the heading of one of the parallel tunnels. The interior surface of the wooden lining is waterproofed with layers of a prepared textile, each layer being mopped with hot asphalt. The main lining of the tunnel, consisting of concrete having a minimum thickness of two feet, is then put in place. The collapsible steel forms, used in placing concrete in the arch, are supported and are shifted by a steel traveler which is moved on two rails, one on each side of the tunnel, as the work progresses. See Plate 3.

The shield for the easterly tunnel was started on May 8, 1915, and had advanced 180 feet from the shaft in free air when the unstable character of the ground made it necessary to stop excavation until the air locks could be installed. Work in this tunnel was resumed on June 29th with about 12 pounds air pressure.

The shield of the westerly tube was started on June 15, 1915, and it had been advanced 105 feet from the shaft when the flow of the clay into the shield caused work to be suspended until the air locks could be installed.

Two tunnels are also being driven by drift methods in free air, from the main shaft southerly about 70 feet.

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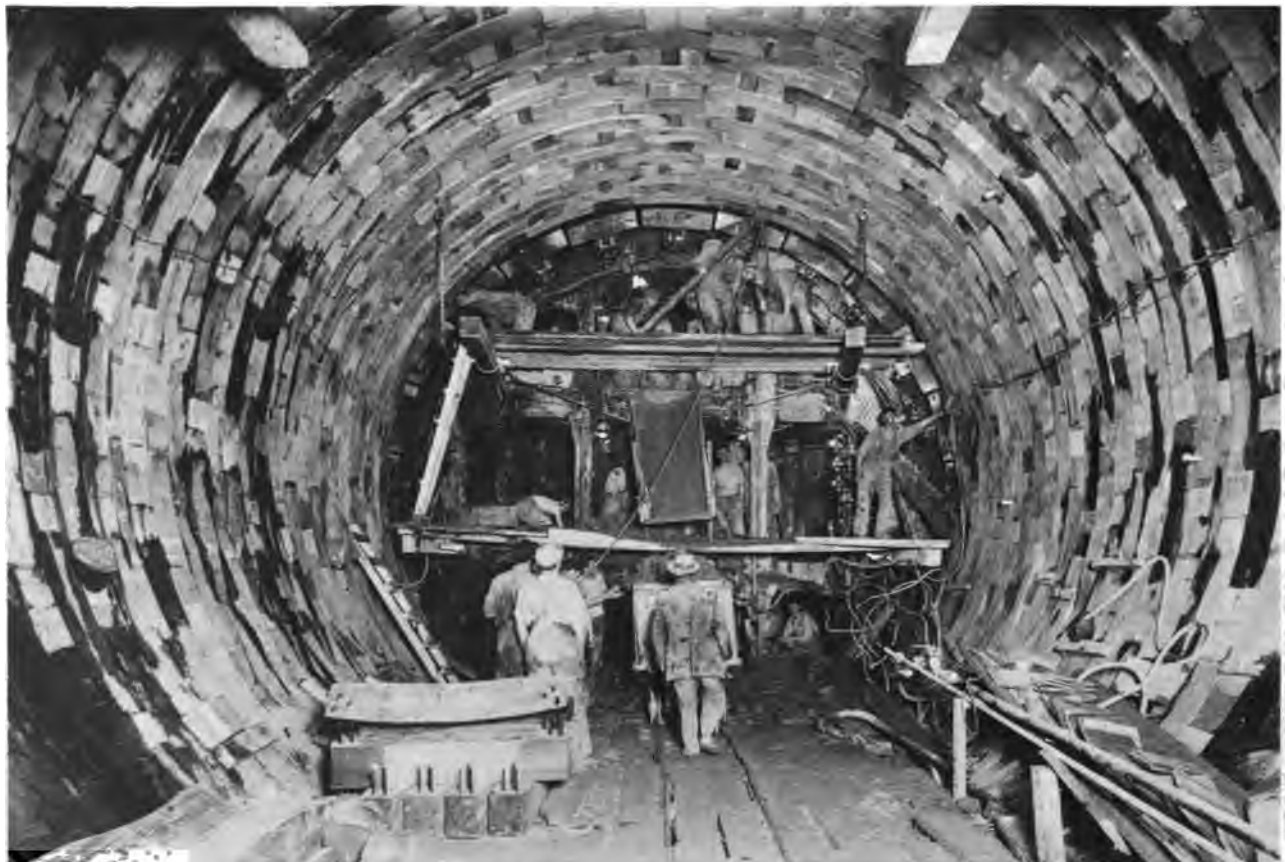

HELIOTYPE CO., BOSTON

...POINT CHANNEL. WORK AT HEADING OF EASTERLY TUBE SHOWING REAR OF SHIELD

...OF TUNNEL

PLATE 2

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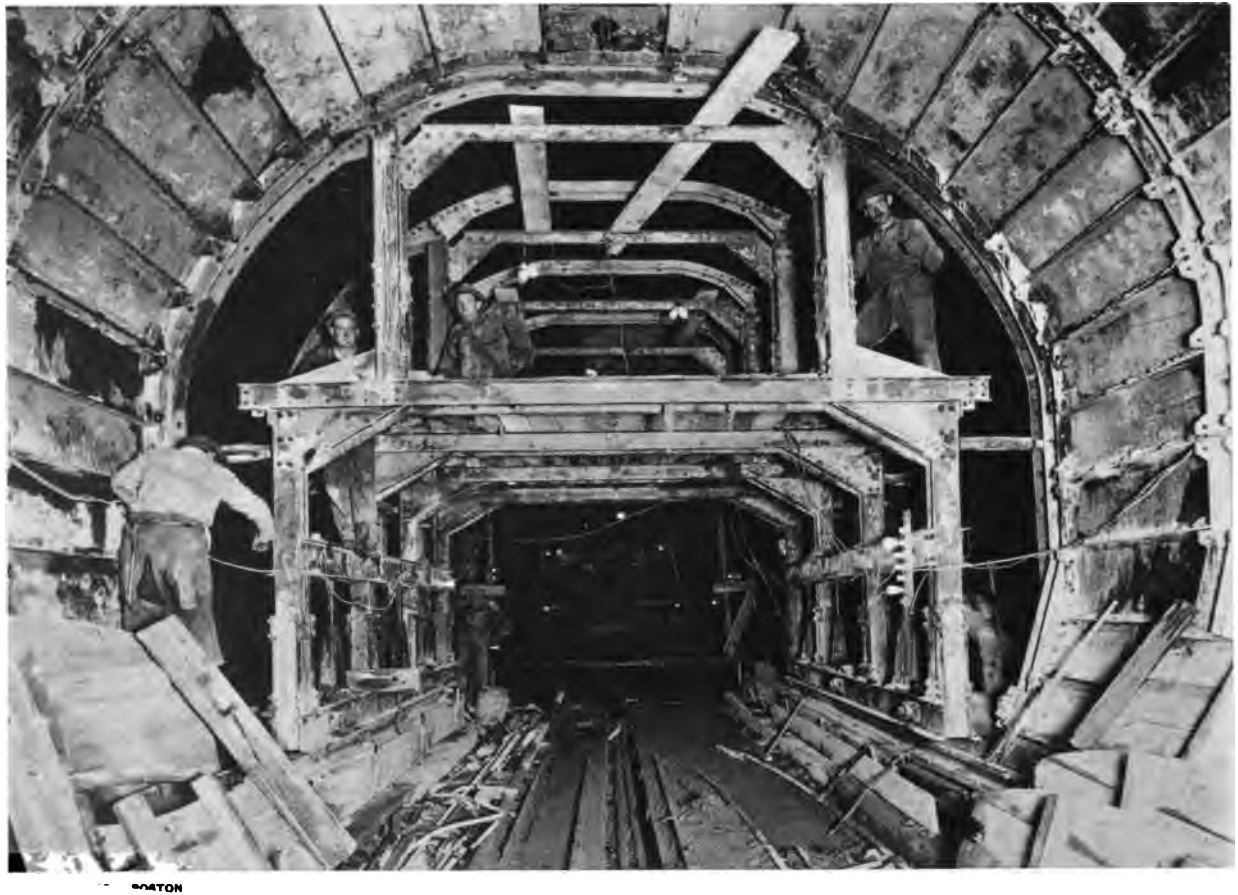

BOSTON

...EASTERLY TUBE. STEEL FORMS FOR CONCRETE WORK AND STEEL TRAVELER FOR

PLATE 3

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SECTION H.

Construction Data.

Location and description of structures: Section H is a two-track structure of reinforced concrete, and extends along Dorchester avenue between Old Colony avenue and Woodward street, a length of about 2,200 feet.
Contractor and date of contract: The T. A. Gillespie Company, March 4, 1915.
Amount of bid: $554,750.00.
Date of beginning of work: April 5, 1915.
Date of completion named in contract: June 30, 1916.
Amount of work done to and including June 30, 1915: Excavation, about 24,400 cu. yds.; Concrete placed, about 909 cu. yds.; Steel rods used for reinforcing concrete, about 47 tons.
Number of men ordinarily employed by the contractor from beginning of work to and including June 30, 1915: Day, about 182; Night, about 143.
Character of earth found in excavation: At the northerly end of the section the earth is mostly clay; at the southerly end it is sand, gravel and a little clay.
Disposition of surplus earth: Teamed to flats near the work.
Appendices in this report showing bids: OO and SS.
Assistant Engineer in charge of construction: Robert B. Farwell.

Construction work has been started at both ends of this section. The Dorchester avenue surface car line, between Andrew square and the northerly end of the section, has been temporarily diverted by the way of Dorchester street and Old Colony avenue. The work is being done by the open cut method, and the contractor is not required to bridge the surface as is the custom in the more congested localities of the city.

At the southerly end of the section, near Woodward street, the earth is being excavated for the entire width of the tunnel in one operation and in lengths of about two hundred feet. Small cars carry the earth along the trench to either end where a traveling crane hoists it in large buckets and dumps it into carts. For a length of about 360 feet the earth has been excavated to grade. The invert has been placed for a length of approximately 200 feet and the sidewalls are being built in sections 40 feet long.

At the northerly end of the section, near Old Colony avenue, the earth is being removed by a cableway. For a length of about 100 feet the earth has been removed to grade, and for a length of 200 feet more, to various depths.

The sides of the excavations are held in place by 4-inch tongued and grooved hard pine sheeting and are braced across by 12-inch by 12-inch hard pine timbers.

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A large amount of water is being encountered, which requires constant pumping.

The center line of the tunnel for this section has been located about 10 feet west of the center line of Dorchester avenue, in order to avoid interference with and consequent relocation of the large intercepting sewer in the avenue. The location of the tunnel interferes with the common Dorchester avenue sewer for surface water. A new sewer is to be built in the haunch of each sidewall of the tunnel to take the place of the old sewer. A larger overflow sewer than now exists is to be built from near D street to the South Bay.

ENLARGEMENT OF PARK STREET STATION.

Construction Data.

Location: Under Boston Common, between lines of Winter street and Temple Place extended.
Plates in this report: 4 and 5.
Contractor and date of contract: Coleman Brothers, August 5, 1914.
Amount of bid: $62,716.00.
Date of beginning of work: August 7, 1914.
Date of completion named in contract: December 1, 1914.
Date of certificate of completion: March 8, 1915.
Amount of work done under the contract: Excavation, about 9,912 cu. yds.; Old concrete masonry removed, about 1,484 cu. yds.; Concrete placed, about 2,942 cu. yds.; Structural steel placed, about 312 tons; Steel rods used for reinforcing concrete, about 73 tons; Old structural steel removed, about 215 tons.
Number of men ordinarily employed by the contractor during the progress of the work: Day, about 49; Night, about 48.
Character of earth found in excavation: Clay under a bed of gravel.
Disposition of surplus earth: Teamed to scows and dumped at sea.
Appendices in this report showing bids: L, U, HH, MM and VV.
Assistant Engineer in charge of construction: Wilbur W. Davis.

The work in general consisted of removing about 481 linear feet of the westerly wall of the old subway just south of the location of the station before the enlargement, building a new wall west of the old location, splicing out the old roof with steel beams and concrete to rest on the new sidewall, and relocating some of the interior steel columns and girders.

Before work was begun both platforms of the station at the southerly end were on sharp reverse curves and narrow, being

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HELIOTYPE CO., BOSTON

ENLARGEMENT OF PARK STREET STATION. LOOKING SOUTH FROM THE WESTERLY TRACK.

PLATE 4

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about four feet in width. The enlargement has permitted lengthening and widening both platforms and the elimination of the sharp curves. See Plates 4 and 5.

Approximate Platform Areas (exclusive of stairways).

	Former area	*Present area*	*Increase*
Westerly platform	8,212 sq. ft.	14,047 sq. ft.	5,835 sq. ft
Easterly platform	7,046 " "	9,625 " "	2,579 " "

Curvature of tracks.

	Former Curvature	*Present Curvature*	*Decrease*
Westerly track	93°–16′–40″	10°–39′–48″	82°–36′–52″
West middle track	56°–54′–10″	17°–08′–10″	39°–46′–00″
East middle track	64°–17′–30″	17°–08′–10″	47°–09′–20″
Easterly track	23°–14′–10″	23°–14′–10″	0

The westerly platform has been lengthened by about 118 feet, and the width now averages about 27 feet. It provides berths for eight cars on each of the tracks for southbound cars on practically a straight track. The location of the southerly stairway has been changed and is now at the southerly end of the new platform. The granite structure over the stairway was moved bodily about 240 feet and placed in the present location over the new stairway. The interior finish of this structure has been replaced with white polished terrazzo.

The easterly platform has been lengthened by about 87 feet and the narrowest part at the southerly end is now 5½ feet in width. There are now eight berths for cars in each side of this platform on practically a straight track. The southerly stairway on this platform has been changed, but the granite structure and its location on the surface of the Common remain the same. A stairway, 15 feet wide, leads from the surface to a landing or lobby about 60 feet in length over the station platform. Near the northerly end of this lobby are located ticket offices by which passengers entering the station, to go north, must pass to a ten-foot stairway leading to the station platform. From a point south of the lobby is an exit stairway, 8 feet wide, leading from the station platform up to the lobby. See Plate 5.

The height of the surfaces of both platforms south of the location of the Cambridge Connection, in the part of the sta-

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tion in which no other change was made on account of the enlargement, was lowered to conform to the new platform in elevation, the edge of which was built 2 feet 3 inches from, and 3 inches above, the grade of the top of the rail.

The interior finish of the new part of the station is white cement plaster on the roof and white glazed tile on the wall.

During the progress of the work of enlargement and reconstruction of the station it was necessary to maintain the traffic of the cars and of passengers in the station. This made the work especially difficult. An average of 25,000 people each day enter the station and leave in cars by the way of the westerly platform alone. There are approximately 3,000 cars passing through the station daily in each direction.

WORK AT JUNCTION OF PARK AND TREMONT STREETS.

Construction Data.

Contractor and date of contract: Coleman Brothers, March 17, 1915.
Date of beginning of work: March 18, 1915.
Date of completion named in contract: June 15, 1915.
Date of certificate of completion: June 30, 1915.
Amount of bid: $12,164.50.
Amount of work done during the year ending June 30, 1915: Excavation, about 1,215 cu. yds.; Concrete placed, about 323 cu. yds.; Old concrete masonry removed, about 325 cu. yds.
Number of men ordinarily employed by the contractor: Day, about 11; Night, about 27.
Disposition of surplus earth: Teamed to scows and dumped at sea.
Appendix in this report showing bids: RR.

North of the Park Street Station, under the junction of Park and Tremont streets, was a triangular core of earth between the concrete sidewalls of the easterly and westerly subway barrels on two sides and the concrete wall of the subway loop on the third side.

There was not clearance enough between the tracks of the loop to permit the latest type of large cars to run on the two tracks around the loop at the same time. Also the motorman on a car passing around the outside track of the loop could not see a car which might be approaching from the north on to the same track, and vice versa. In order to increase the clearance, and to leave unobstructed vision and prevent chance of acci-

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dent, the core of earth and some of the concrete structure has been removed. For a length of about 50 feet the easterly concrete sidewall and the arched roof of the barrel for cars coming from the north was removed and structural steel columns and girders substituted for the old concrete wall, and a new roof built over the track. The northerly wall of the subway for cars passing around the loop at this place has been removed and steel columns substituted, allowing more clearance for the cars. The roof over the increased area of the subway caused by the removal of the earth is of steel beams and concrete.

BOYLSTON STREET SUBWAY.

GENERAL STATISTICS.

Constructed in accordance with Chapter 741, Acts of 1911, and as modified by Chapter 810, Acts of 1913.

Work on construction begun on March 18, 1912.

Opened for public travel on October 3, 1914.

Length from head of incline at Kenmore street to temporary connection with Tremont Street Subway at Carver street, 7,937 feet or about 1½ miles.

Length of single track, including tracks in the inclines, about 17,200 feet.

Length of curves (400 to 5,000 feet radius) 2,506 feet or about 32 per cent. of the length of the Subway.

Curvature, a total deflection of 152 degrees.

Length wholly or partly under buildings, about 380 feet, between Massachusetts avenue and Hereford street.

Greatest depth of bottom of structure below the surface, 39 feet.

Type of structure, reinforced concrete tube. Two adjoining tubes, each for one track, from foot of incline to Hereford street; one wide tube, for two tracks, from Hereford street to Copley station; one wide tube, with center row of columns, from Copley station to pump well at incline near Church street; two tubes from pump well to foot of Church street incline; one four-track Subway, with interior columns, from foot of incline to junction with the existing Subway.

Amount of work done:

Earth excavated, about 392,400 cu. yds.

Standard concrete placed, about 118,700 cu. yds.

Other mixtures of concrete placed, about 5,350 cu. yds.

Steel rods used for reinforcement, about 6,570 tons.

Structural steel placed, about 1,554 tons.

Steel sheet piling used, about 990 tons.

Textile and asphalt waterproofing, about 273,085 sq. yds., measured single ply.

Cement used, about 196,400 barrels.

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Total cost, $4,929,307.00, of which $758,013.00 is for land takings and interest.

Assistant Engineer in charge of construction: Laurence B. Manley.

The work done during the past year has in general consisted in completing the interior finish of the Massachusetts and Copley stations, and constructing the connection of the Boylston Street Subway with the Tremont Street Subway at Charles street. In addition, the streets and sidewalks along the line of the subway have been repaved, excepting those portions previously repaved and also excepting the roadway portion of Boylston street between Arlington street and Carver street.

The contract for the general construction of the Massachusetts and Copley stations of the Boylston Street Subway was substantially completed at the date of the last annual report, and the location and the general arrangement of these stations was described therein. No interior finish work was called for in the original construction contract, and the work of transforming the rough concrete shell as left by the subway contractor into the finished stations was carried out during the summer of 1914 in a series of small contracts. This finish work has included the concrete floors, walls, stairways, partitions and other work attached to and forming a part of the structure. The equipment of the subway, including tracks, signals, lights, pumps, fans, booths, etc., has been installed by the lessee, the Boston Elevated Railway Company.

The interior finish of the two stations is similar. The ceilings and upper half of the walls are of white cement plaster. The lower half is of white polished terrazzo, with a band of white and colored ceramic tile and polished terrazzo between the white terrazzo and the plaster, and another band at the bottom between the terrazzo and the granolithic base. The colored band is also carried around the advertising panels. The color of the tile and terrazzo border in the Massachusetts station is red; that in the Copley station is blue. The surfaces of the platforms and passageways are of granolithic. The edges of the platforms next to the tracks are bordered with a strip of white cement 6 inches wide, 2 feet 3 inches distant from the rail, and 3 inches above the grade of the top of the rail. The roadbed in both stations was constructed by the Boston Elevated Railway Company. The rails are fastened with screw spikes to creosoted ties on a crushed stone bed in the ordinary manner, but for sanitary reasons the crushed stone at the stations is

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HELIOTYPE CO., BOSTON

ENTRANCE TO COPLEY STATION, WEST SIDE OF DARTMOUTH STREET, NORTH OF BOYLSTON STREET

PLATE 7

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covered with a smooth layer of concrete which may be washed clean. This concrete surface slopes from the white edge of the platform to the head of the nearest rail and then drops to the surface of the ties and slopes slightly away from the platform into drains beyond the track.

The structural steel columns supporting the roof are encased in concrete. The doors, ticket offices and news-stands are covered with sheet copper, and, with the exception of the oak handrails, there is no exposed woodwork on the inside of the subway which might catch fire.

At the Massachusetts station a waiting room at the street level on Massachusetts avenue and a stairway leading to the lobby, also an exit passageway leading to Newbury street, have been completed. At the easterly end of the station, at the top of the stairways leading from the platforms to the roof, a brick building has been constructed which can be used for entrance and exit. From this building there is a passageway about 15 feet wide, on top of the roof of the subway, with a stairway leading to Boylston street near Hereford street.

At the Copley station three stairway coverings have been built, one over the stairway leading to the platform for eastbound cars on the northerly side of the Public Library and two over the stairways in Dartmouth street leading to the platform for westbound cars. The covering at the Public Library is of cast iron and glass and is designed to harmonize with the grille work of the Library building. See Plate 6. The coverings over the Dartmouth street stairways are of granite, with bronze and copper covered roofs. One of them is shown on Plate 7. These stairway coverings were designed by Fox & Gale, architects.

RESTORATION OF SURFACE OF STREETS.

The surfaces of the streets and sidewalks adjoining the route of the subway have been restored with the exception of the final paving of the roadway in Boylston street between Arlington street and Carver street. Bids have been opened for the work, but the contract has not yet been awarded.

At the junction of Massachusetts avenue and Newbury street a contract for repaving was let and the work done in November, 1914. Wood block pavement was laid in Newbury street and asphalt in Massachusetts avenue. The street and sidewalk surfaces on Boylston street westerly from Exeter street

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were restored previous to the time covered by this report. Between Exeter and Arlington streets the contractor for Sections 3 and 4 raised and relaid the sidewalks in accordance with the requirements of his contracts. In June, 1914, alternate bids were received by the Commission for the repaving of this section of Boylston street with either asphalt, bitulithic, or wood blocks. On account of the request of the Public Works Department for wood blocks, this kind of pavement was laid.

Boylston street between Arlington street and Charles street has been widened so as to provide space for the new incline located in or near the middle of the street. See Plate 8.

The Act of the Legislature which authorized the temporary connection of the Boylston Street Subway with the Tremont Street Subway, (Chapter 810, Acts of 1913) also authorized the widening of Boylston street from Charles street to Church street to 120 feet, and from Church street to Arlington street to a width varying from 120 feet at Church street to 80 feet at Arlington street. The Board of Street Commissioners authorized the extension of the widening between Church street and Arlington street to a constant width of 120 feet. The southerly sidewalk in Boylston street between Arlington street and Park square was widened from 12 to 15 feet, during the fall of 1914, at the request of the Public Works Department. An additional island platform for street car passengers was constructed by the Boston Elevated Railway Company in Boylston street, extending from the westerly end of the incline to Arlington street. In order not to interfere with the Channing monument at Arlington street, and to avoid cutting down a large English elm near the same place, the curb and sidewalk of the north roadway has been curved to the south so as to run nearly parallel with the tracks for a distance of about 150 feet easterly from Arlington street. The curb of the northerly sidewalk has been reset and the sidewalk paved with brick.

In connection with the work of resurfacing the street some grading has been done in that part of the Public Garden where the old incline was located, and the heavy granite coping taken from the old incline has been set as a curb to mark the division line between Boylston street and the Public Garden.

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HELIOTYPE CO., BOSTON

NEW INCLINE IN BOYLSTON STREET, TO TAKE THE PLACE OF THE OLD INCLINE IN THE PUBLIC GARDEN WHICH HAS BEEN FILLED.

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SECTION 5.

Construction Data.

Location and description of structures: See text below and Twentieth Annual Report.
Plate in this report: 8.
Contractor for construction and date of contract: Hugh Nawn Contracting Company, September 15, 1913.
Date of completion named in contract: May 1, 1914.
Date of beginning of work: September 16, 1913.
Date of certificate of completion: September 5, 1914.
Amount of work done under the contract: Excavation, about 62,607 cu. yds.; Standard concrete placed, about 16,967 cu. yds.; Structural steel placed, about 596 tons; Steel sheet piling driven, about 31 tons; Steel rods used for reinforcing concrete, about 1,070 tons.
Number of men ordinarily employed by the contractor during the progress of the work: Day, about 270; Night, about 330.
Character of earth found in excavation: Gravel filling over silt and peat.
Disposition of surplus earth: Some was sent to the site for the Massachusetts Institute of Technology in Cambridge, and some was teamed to scows and dumped at sea.
Appendices in previous report and in this report showing bids: XX., DD and TT; XXI., YY and AAA.

In general, the work on Section 5 during the past year has consisted in connecting the Tremont Street Subway with the Boylston Street Subway near Charles street, removing the roof and a portion of the wall of the old subway west of the connection, constructing the new incline in Boylston street and filling the old incline in the Public Garden and a portion of the abandoned part of the old subway. A portion of the old subway, sufficient for a sidetrack for storing three cars, has been left. The work of making the connection, which included the widening of the old subway for a length of 60 feet westerly from the point of connection, the removal of 225 feet of the southerly sidewall of the old subway, erection of columns and the construction of the roof, was carried on without serious interference with the subway traffic and without accident. At this place an average of about 2,000 cars per day pass in each direction. The inbound surface cars were diverted from the old to the new incline on July 26, 1914, and the outbound surface cars on September 5, 1914.

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HELIOTYPE CO., BOSTON

INCLINE IN CAMBRIDGE STREET AT THE WESTERLY END OF THE EAST BOSTON TUNNEL EXTENSION.

PLATE 9

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EAST BOSTON TUNNEL EXTENSION.

GENERAL STATISTICS.

Constructed in accordance with Chapter 741, Acts of 1911.
Work on construction begun November 29, 1912, and is now substantially completed with the exception of some detail work in connection with the stations, such as plaster and terrazzo finish, granolithic platforms and the coverings on the surface over the entrances and exits.
Length from head of incline in Cambridge street to connection with the East Boston Tunnel near the westerly end of the Ames Building, about 2,610 feet.
Length of single track, including crossovers and tracks in the incline, about 5,660 feet.
Amount of work done:
Earth excavated, about 110,673 cu. yds.
Concrete placed, about 31,160 cu. yds.
Steel rods used for reinforcement, about 1,531 tons.
Structural steel placed, about 1,296 tons.
Assistant Engineer in charge of construction: Robert B. Farwell.

The East Boston Tunnel Extension is built of reinforced concrete and structural steel and is designed for two tracks. It begins at a point in the original East Boston Tunnel about 90 feet west from the westerly line of Washington street and extends under Court street, Scollay square, Bowdoin square, Green and Cambridge streets and comes to the surface by an incline in the middle of Cambridge street between Chambers street and North Russell street. At this place Cambridge street has been widened about 46 feet to provide a roadway on each side of the incline. See Plate 9.

At the beginning of the East Boston Tunnel Extension near Washington street, the grade of the old tunnel was lowered, the Court street station abandoned and a new station built in Scollay square below the old station of the Tremont Street Subway, with transfer connections between the two. At Bowdoin square is another station. Just west of Bowdoin square, under the buildings between Green street and Cambridge street, is a loop track which enables cars from East Boston to return without coming to the surface by way of the incline.

The construction of this tunnel required the careful supporting and underpinning of the front walls or piers of many adjacent buildings. Some of the most difficult work required was the supporting of the old Scollay square station and not interrupting traffic of the cars while the earth was being exca-

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HELIOTYPE CO., BOSTON

INCLINE IN CAMBRIDGE STREET AT THE WESTERLY END OF THE EAST BOSTON TUNNEL EXTENSION.

PLATE 9

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vated and the foundations placed for the new station below. See Twentieth Annual Report, page 49, for a more detailed description.

The interior finish of the stations is similar to that of the Boylston Street Subway stations and the Washington station of the Dorchester Tunnel, namely, white cement plaster on the ceilings and upper part of the walls above a wainscoat, about six feet high, of white polished terrazzo. There are two bands of ceramic tile near the top of the terrazzo wainscoat, and one band at the bottom above the granolithic base. The color of the band in the Bowdoin station is dark blue, and in the station at Scollay square, to be known as the Scollay Under station, is red.

SECTION G.

Construction Data.

Location and description of structures: Section G begins in Court street near the westerly end of the Ames Building and extends to a point under Court street opposite Stoddard street and includes a station for the East Boston Tunnel Extension under and near the existing station in Scollay square.

Contractor for construction of tunnel and station proper and date of contract: Isaac Blair & Company, Inc., December 2, 1912.

Date of beginning of work: November 29, 1912.

Amount of work done during year ending June 30, 1915: Excavation, about 6,500 cu. yds.; Concrete placed, about 4,440 cu. yds.; Structural steel placed, about 327 tons; Steel rods used for reinforcing concrete, about 113 tons.

Total amount of work done under the contract: Excavation, about 50,500 cu. yds.; Concrete placed, about 14,140 cu. yds.; Structural steel placed, about 934 tons; Steel rods used for reinforcing concrete, about 613 tons.

Number of men ordinarily employed by the contractor for construction during year ending June 30, 1915: Day, about 105; Night, about 58.

Character of earth found in excavation: The ground, below a few feet of filling, generally consists of a mixture of sand, gravel and clay, until about 30 feet below the surface, after which the blue clay is generally continuous.

Disposition of surplus earth: Some was sent to the site for the Massachusetts Institute of Technology in Cambridge, and some was teamed to scows and dumped at sea.

Contractor for building and erecting one double-file ascending cleat type escalator, with each file independently driven and both mounted on one truss: Otis Elevator Company.

Date of contract: February 9, 1915.

Contract price: $20,180.00.

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Contractor for furnishing structural steelwork and dates of contracts: Bethlehem Steel Company, September 19, 1912; December 12, 1912; November 14, 1913.
Appendices in this report showing bids: AA, CC, NN, PP, XX and BBB.

During the year the work on Section G has comprised the general construction of the Scollay Under station and the construction of the tunnel to the east of the station. The station has been completed with the exception of some of the terrazzo finish on the walls and white cement plaster finish on the upper part of the walls and on the ceilings, granolithic on the platforms, installing the escalator and some other details connected with the finish and equipment of the station. Structures on the surface covering the stairway exit and the escalator exit in the middle of Court street in front of the Crawford House and a structure over the entrance stairway on Hanover street are yet to be constructed. The part of Section G west of the station was substantially completed at the date of the last annual report. Easterly from the station the work has involved the lowering of the grade of the East Boston Tunnel between Cornhill and the westerly end of the Ames Building. This has required the removal of the old invert and very considerable portions of the old tunnel walls and the building of a new invert and new walls, together with the use of heavy steel girders to support the roof and portions of the walls of the old structure that were not removed. Such portions of the work as could be built while maintaining the use of the Court street station for traffic were built first. This included some of the column foundations and the setting of the steel girders at the westerly end of the old Court street station. The work entailed the removal of a large amount of concrete masonry and the careful supporting of the old structure. It became necessary to discontinue the use of this station on November 15, 1914, and a temporary terminus of the East Boston Tunnel was made at Devonshire street station. An enclosed board walk passageway, eight feet wide, was built in the tunnel to enable the passengers to go from Devonshire street station to the Scollay square station. The location of this passageway was changed at times as the progress of the work required. At this date the tunnel east of Scollay square is practically completed, there remaining the completion of about 20 feet of the southerly wall and the concrete casings around some of the steel.

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SECTION H.

Construction Data.

Location and description of structures: Section H is located in and near Court and Cambridge streets. It extends from Stoddard street to Staniford street, and includes the Bowdoin station.

Contractor for construction of tunnel and station proper and date of contract: Coleman Brothers, February 19, 1914.

Amount of bid: $372,400.00.

Date of beginning of work: March 2, 1914.

Date of completion named in contract: December 31, 1914.

Date of certificate of completion: December 4, 1914.

Amount of work done under the contract: Excavation, about 46,754 cu. yds.; Concrete placed, about 12,704 cu. yds.; Structural steel placed, about 286 tons; Steel rods used for reinforcing concrete, about 717 tons.

Number of men ordinarily employed by the contractor for construction during the progress of the work: Day, about 145; Night, about 121.

Character of earth found in excavation: Below 8 to 10 feet of filling, the ground usually consists of clay mixed with sand.

Disposition of surplus earth: Mostly teamed to scows and dumped at sea.

Contractor for furnishing structural steelwork and dates of contracts: Bethlehem Steel Company, September 19, 1912; December 12, 1912; November 14, 1913.

Appendices in previous report and in this report showing bids: XX., EE; XXI., LL, NN, QQ, TT, XX, ZZ and CCC.

The construction of this section was nearly half done at the date of the last annual report. The work of underpinning, building the sidewalls, removing the core and building the invert and roof proceeded usually in the order named until the completion of the contract. As the section extends under several buildings in the vicinity of Bowdoin square a large amount of shoring and supporting was required in building the structure. This was particularly true of the loop to the west of the square between Green street and Cambridge street. In such cases a short portion of the tunnel was built and the foundations of the building supported upon the walls and roof. Many changes of water pipes were required in Bowdoin square and in Green street and considerable relocating of pipes and ducts by the public service corporations was necessary. Since the completion of the general contract for the work, the finishing of the Bowdoin station has been under way. The terrazzo and plaster finish on the walls and roof is at this date practically completed. There remains to be done the building of the structures on the surface over the entrance and exit stairways, the placing of the granolithic on the platforms and some minor detail work connected with the station.

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STOCKYARD AT C AND CYPHER STREETS, SOUTH BOSTON.

Assistant Engineer in charge: Philip B. Walker.
Inspector in charge of structural steelwork: Alfred W. Parker.

Substantially all the materials used in the construction of the subways and tunnels in Boston, with the exception of crushed stone, stone dust, sand and lumber, are purchased by the Commission and furnished to the various contractors doing work for the Commission, Such materials as are furnished, namely, waterproofing, reinforcing rods, structural steel, cement, sewer pipe, grouting pipes, etc., are kept on hand at this stockyard and delivered at the various sections under construction. An average force of 56 laborers, 2 crane operators and 1 superintendent has been employed in the handling of this material during the past year.

All reinforcing rods used on Commission work are of open-hearth steel and are cut and bent accurately to shape before being delivered to the contractors. These rods vary in size from ¼ inch square to 1¼ inch square, and are of the following types:—Diamond, Havemeyer, Slick, Corrugated, Square Twisted and Plain Square. During the past year a total of 1,900 tons of reinforcing rods has been cut, bent and delivered to various parts of the work. The use of motor driven wire brushes for cleaning all kinds of steel reinforcement has proved very satisfactory and is a much cheaper method than that of cleaning by hand.

The greater part of the cement used by any contractor on the construction of a section is shipped directly to him in carload lots. However, there is kept on hand at the stockyard approximately 5,000 barrels of tested cement to fill the orders for station finish, paving and grouting. This reserve supply is also available in an emergency for the use of any contractor doing work for the Commission and prevents delay in construction due to the non-arrival of cement which he has ordered. During the period covered by this report, 34,400 barrels of cement of various brands have been delivered from this yard for finish, grouting and contract work. The brands of cement delivered for general use were, Atlas, Lehigh, Nazareth, Dexter, Allentown, Giant, Pennsylvania and Phoenix. Smaller quantities of White Atlas

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cement, Hoffman Natural cement and Aëgir Erz cement, the latter imported from Germany, have been delivered as required.

The construction of concrete stairways at the stations has been greatly facilitated by casting stair units at this yard. Each unit is composed of one reinforced concrete tread and riser cast together. One or more units may make up the full width of a stairway. After gaining sufficient strength these units are teamed to the work and set directly in place. Other special concrete shapes, such as ventilators, drain and hatch covers, have also been made.

The shop for fabricating structural steel, together with the area used for the storage of such steel, occupies about one-third of the area of the stockyard. From November, 1914, to February, 1915, work was carried on during two shifts of 8 hours each, to keep up with the requirements of the contractors. Steelwork has been fabricated for Section 5 of the Boylston Street Subway, Sections D and E of the Dorchester Tunnel, Park Street Station Enlargement, and Sections G and H of the East Boston Tunnel Extension. A total of about 1,860 tons has been fabricated during the past 12 months, requiring an average force of 21 skilled iron workers.

The following amounts of materials have been received at the yard during the past year:

Asphalt for waterproofing	417 tons
Waterproofing fabric	160,161 sq. yds.
Steel reinforcing rods	2,220 tons
Structural steel and iron	1,016 tons
Cement	35,235 barrels
White quartz sand	145 tons.

The above materials were received at the yard in 346 freight cars or an average of over 6 cars per week.

Deliveries were made from this yard during the past year to the various subway and tunnel sections under construction as follows:

Asphalt for waterproofing	394 tons
Waterproofing fabric	154,589 sq. yds.
Steel reinforcing rods	1,900 tons
Structural steel and iron	2,087 tons
Cement	34,400 barrels
White quartz sand	125 tons.

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WORK DONE IN THE CEMENT TESTING DEPARTMENT AND CHEMICAL LABORATORY FOR THE YEAR ENDING JUNE 30, 1915.

Chemist and Cement Tester: HAROLD C. DELONG.

Cement Testing. Samples have been tested from about 100,000 barrels of cement for use in the subways and tunnels under construction. The regular tests have been as follows:

Soundness by the boiling test.
Fineness by the 100 and 200-mesh sieves.
Setting time.
Tensile strength of neat briquettes at the age of 24 hours, 7 days and 28 days; of mortar briquettes, made in the proportion of 1 part of cement to 3 parts of standard Ottawa sand, at the ages of 7 days and 28 days.

Occasional tests have been made for specific gravity.

Concrete Aggregates. The aggregates used for concrete by the contractors have been regularly inspected and samples have been frequently taken and tested. The tests of sand have included a screen analysis, using the Nos. 4, 10, 20, 30, 40, 50, 80 and 100 screens; and determinations of tensile strength of briquettes made with mortar in the proportion of 1 part of cement to 3 parts of sand by weight at the ages of 7 and 28 days.

Similar tests have been made of stone dust except that the briquettes for testing were made in the proportion of 1 part of cement, 1 part of sand and 1 part of stone dust.

The tests for coarse aggregate or stone include the determination for voids and a screen analysis, using the $2\frac{1}{2}''$, $2''$, $1\frac{1}{2}''$, $1''$, $\frac{3}{4}''$, $\frac{1}{2}''$ and $\frac{1}{4}''$ screens.

It has also been found advisable to test the strength of concrete made with varying kinds and proportions of aggregates. For this purpose concrete blocks have been made, in the form of cylinders, 8 inches in diameter by 16 inches long, and tested in compression at the age of 28 days or more. As the Commission has no testing machine large enough to break such blocks, the breaking has been done at the Massachusetts Institute of Technology under the direction of Prof. Harrison W. Hayward.

Concrete beams 6 inches by 6 inches by 3 feet have also been made from mixtures in like proportions as for cylinders. These have been broken in the beam testing machine belonging to the Commission in the laboratory at the Cypher street yard.

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Concrete.—The concrete as made by the contractor also has been tested in the shape of concrete blocks and beams just described. It is customary to divert a load of concrete which is being carted from the mixer to the work and fill a number of molds from the diverted load. These blocks when tested give an idea of the strength of the concrete which the contractor is producing, irrespective of more or less theoretical laboratory tests.

Asphalt and Asphalt-Saturated Cloth.—The routine tests which are made on these materials are as follows:

For Asphalt.—The melting point, the loss in weight when 50 grams are heated at 325° F. for 7 hours, and the solubility in cold carbon disulphide are determined.

For Asphalt-saturated cloth.—The weight of saturation per square yard, the weight of unsaturated cloth per square yard, and the tensile strength of the unsaturated cloth both lengthwise and crosswise are determined.

When new waterproofing materials are submitted for examination additional tests are made. In the laboratory these consist of the following:

For Asphalt.
- Tests for brittle point.
- Tests for penetration with the New York Testing Laboratory Penetrometer, both before and after heating at 325° F. for 7 hours.
- Specific gravity.
- Analysis for paraffin.

Field tests also are made on these new waterproofing materials, which give valuable information. For this purpose a piece of wall and invert 20 feet long has been constructed at the Cypher street yard. The wall is 6 feet high and the invert is 6 feet wide. It is customary to test a new brand of asphalt by applying it to Minwax Saturated Cloth, and a new brand of asphalt-saturated cloth by applying to it Standard Oil asphalt, both of which materials are now being used by the Commission. To make the tests several two-ply waterproofing strips are put on the wall and invert as is done in actual work, except that the plies are placed evenly one over the other and not lapped as is usual. Careful observation is made as the material is applied to see just what quality of work can be secured with the new material. The amounts of asphalt used are carefully measured.

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The temperature of the asphalt is carefully regulated and the temperature of the air noted. After application the strips are left in place a few days and are then removed by pulling either two plies from the wall, or by pulling one ply from the other. A yoke the width of the fabric grips the top end of the ply or plies. Two or more men then pull in a horizontal direction from the wall and slowly remove the fabric. A spring balance measures the pull necessary to remove the ply or plies and thus indicates the bond between waterproofing and wall, or between two plies of waterproofing.

Tests have been made to determine whether or not there would be any injurious reaction effects between different brands of asphalts when a brand made by one concern is applied to a cloth or membrane saturated with asphalt made by another. For example, test pieces were made up of Standard Oil asphalt and Minwax Saturated Cloth. These were made up two-ply to imitate the waterproofing used in actual construction work. Strips were also made up using Minwax asphalt and Minwax Saturated Cloth and some in which the asphalt was a mixture of Standard Oil asphalt and Minwax asphalt. Some of the strips of each kind were continuously exposed to the air, some continuously kept under water, and some were kept in water and air alternately. At periods of one month, two months, three months and six months the strips were inspected, the asphalt was dissolved off the cloth and the cloth tested in the tensile strength machine. At the same time that the strips were made up, cubes, one inch on edge, were made of Minwax asphalt, Standard Oil asphalt and a mixture of these two asphalts. Part of each kind were kept continuously in air, part continuously in water, and part were exposed to air and water alternately. At the same periods at which the strips were tested, cubes of each kind were given a bonding test between blocks of concrete. The results of this test indicate that so far there is no injurious reaction of any sort between Standard Oil asphalt and Minwax Saturated Cloth or between Minwax asphalt and Standard Oil asphalt.

Water Analysis.—Frequent samples of ground water are taken from the excavations at the various sections of subway or tunnel under construction, and are analyzed for contents of chlorine and frequently for sulphates. The chief purpose is to study the contamination by sea water. Rough qualitative

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analyses are also made for sewer contamination. Many analyses are also made of the leakage water in the East Boston Tunnel. In these analyses chlorine and sulphates are always determined.

Air Analysis.—The specifications for work in the tunnels require that the volume of fresh air to be supplied shall be sufficient to permit work without danger or discomfort, and at all times and places to prevent the accumulation of carbon-dioxide to a greater amount than one part in one thousand by volume. To determine whether the ventilation provided is sufficient to comply with the requirements of the specifications, samples of air are taken from the headings of the various drifts or tunnels and analyzed for carbon dioxide.

Iron and Steel Analyses.—These have consisted of analyses of rivets for sulphur and phosphorus. From each shipment a rivet is taken from each keg and analyzed. So far all rivets have complied with the specifications.

MISCELLANEOUS EXPERIMENTS.

Long Time Tests of Cement.—It is customary to start a long time test to determine the tensile strength on each brand of cement which the Commission uses. Accordingly a large number of briquettes have been made up at different times of the various brands of cement used. These briquettes are made up both neat and as a mortar of 1 part of cement to 3 parts of standard Ottawa sand. They have been, or are to be, broken at the following periods after making: 24 hours (neat only), 7 days, 28 days, 2 months, 3 months, 6 months, 1 year, 2 years, 3 years, 5 years, 10 years and 20 years.

Tests to Determine Effects of Sea Water on Cement.

Twenty-four brands of cement were tested for resistance to the deteriorating action of sea water. This test was similar to the one carried out in 1913–14 [see page 53 of Twentieth Annual Report] but consisted of the action on pats only and not on briquettes. This test confirmed the results obtained by the previous test, namely, that cements relatively low in alumina (Al_2O_3) are generally more resistant to the action of the sea water than cements relatively high in alumina. The cements tested this year included the following brand: Allentown, Alpha (Lehigh Valley), Alpha (Hudson River), Alsen,

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Atlas (Lehigh Valley), Atlas (Hudson River), Atlas (White), Dexter, Dragon, Edison, Giant, Helderberg, Ironclad, Knickerbocker, Lehigh, Medusa (White), Phenix, Nazareth, Penn-Allen, Pennsylvania, Saylor, Universal, Vulcanite, which are all Portland cements, and Hoffman Rosendale, a natural cement.

Tests of Rosendale Cement.—In doing some preliminary work on the Dorchester Tunnel it was thought advisable to plug some drains by grouting with cement. For this purpose it was feasible to use a natural cement, both on account of its cheapness and on account of its low early strength. Only a small amount of this cement was used, Hoffman Rosendale being the brand selected. Although slow hardening this cement is quick setting. Tests were made of the mortar to find out the effect of re-tempering it from one to six hours after mixing. From briquettes thus made it was found that at the 24-hour period the cement had lost over 66 per cent. in strength by re-tempering; at the 7-day period about 50 per cent.; and at the 28-day period less than 20 per cent. It seemed to make little difference whether the cement was re-tempered one hour or six hours after mixing.

Tests of Sand and Gravel from Various Sources.—The tests made on sand consist of determination of voids, of specific gravity, screen analysis and tensile strength in briquettes when mixed with cement. The tests on gravel include the determination of voids, screen analyses and careful examination of the materials in the pebbles themselves.

Beams and cylinders made of sand and gravel from various sources have from time to time been tested for comparison with similar tests of beams and cylinders made of aggregates required by the Transit Commission specifications.

Voids in Cinders.—Tests have been made for voids in cinders and were found to be 53.2 per cent. for dry cinders and 47.0 per cent. for wet cinders.

Flash Point of Asphalt.—In connection with the work under Fort Point Channel, which will be done in compressed air, it was desired to know the flash point of the asphalt which the Commission is now using. This was found to be about 500° F. The flash point of an asphalt is the temperature at which it gives off gases that will be ignited by a flame at the surface of the asphalt.

Paint Tests.—Various paints have been submitted to the Commission during the past year for testing. The paints were

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generally of two classes, namely, those for concrete and those for steel and iron. The test of paints for concrete generally consists in painting a small area of the air-duct of the East Boston Tunnel, where the paint is subject to damp conditions and wear. No paint has yet been found that will stay on that surface any reasonable length of time.

The ordinary test of paints for iron and steel consists of painting pieces of clean steel according to directions and exposing them to the action of weather or burying them in the ground. Sometimes exposed steel members in various parts of the subways or tunnels were painted and the results observed. Some of the paints tested have given good results, others have failed.

One of the qualities desired for paint is that it may be applied to steel members without interfering with the bond between the steel and the concrete which may be placed about them. For this purpose the Commission has for several years used Tockolith paint. Several paints have been submitted this year as substitutes. In order to compare these paints with Tockolith it was decided to imbed steel rods coated with the various paints in concrete and observe the effect of the paint on the bond between the steel and the concrete by pulling the rods out of the concrete after several months. It was also decided to expose some of the rods so painted and imbedded to electrolysis. These tests are now taking place but have not been completed.

Moisture in Clay.—Various samples of clay have been submitted to the laboratory during the year for the purpose of determining the percentage of moisture in the clay. Clay from various borings and test pits along the route of the Dorchester Tunnel contained from 24.5 per cent. to 40.2 per cent. of moisture. A mixture of clay and sand from the excavation of Section E, Dorchester Tunnel, contained 26.2 per cent. of moisture.

Test for Effects of Carborundum in Granolithic.—As the Commission has no data showing the effect of the addition of carborundum or the proper proportions of it to add to mortar for the granolithic surface, tests were made to determine these points.

A large number of briquettes were made up of cement mortar in which carborundum was substituted in various amounts for the sand and stone dust used in granolithic work. The pro-

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portions of the mortar were 1 part of cement to 2 parts of sand, stone dust and carborundum mixed in various proportions. It was found that carborundum to the amount of 50 per cent. of the weight of the cement could be substituted for sand or stone dust without causing deterioration in the strength of the mortar. Less than this amount, however, gives the desired effect. Granolithic slabs 1 yard square were made up of mortar to which respectively 10 per cent., 25 per cent. and 50 per cent. of carborundum, by weight of cement, had been added. The carborundum was added to the mortar during the mixing. Two slabs were made without carborundum in the mixture and when the mortar had partly set carborundum was trowelled into the surface to the amounts of 12½ per cent. and 25 per cent. by weight of cement. The slabs were then placed in a sidewalk outside the Cypher street yard, where they were subject to traffic. While observations are not completed on this experiment it is evident that the slabs into which the carborundum was trowelled are less satisfactory than those into which it had been incorporated in the mixing. It is probable that the slab with 10 per cent. of carborundum gives the desired effect in the tread as well as that having 50 per cent. of carborundum.

Tests of Lamp Black.—Nine brands of lamp black were purchased in the open market in Boston and tested to find out which was the best and most economical to use.

Lamp blacks of the various brands were incorporated into granolithic slabs in the proper proportion as had been determined by previous tests. The slabs were then placed in a sidewalk outside the Cypher street yard. Observation is not yet complete on these slabs but from results to date it may be stated that the more expensive lamp blacks have much more coloring power than the cheaper ones.

Chemical Work.—The strictly chemical work has included, besides water analysis and steel and iron analysis, the analysis of much cement. The Commission is now buying two brands of cement for the Dorchester Tunnel with the specification that the alumina (Al_2O_3) shall not exceed 6½ per cent. Samples from every car of these brands of cement have been analyzed. Various other brands of cement have been analyzed in the same way.

The tests previously described are the more important ones made during the year. Other tests on various prepared

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bituminous and other products for waterproofing, compounds for cement hardening, etc. have been made. Some of these materials may be of some value on work where the conditions and the results to be obtained are different from those found or required in our subway and tunnel work.

ENGINEERING FORCE.

The names of all of the assistants who have been employed more than one month during the past year are given in Appendix I. I am indebted to all of them for their co-operation and efficient service.

Respectfully submitted,

EDMUND S. DAVIS,
Chief Engineer.

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APPENDIX A.

BOYLSTON STREET SUBWAY.

The Boylston street subway was constructed by the Boston Transit Commission, under Section 5, Chapter 741, Acts of 1911. It takes the place of the Riverbank Subway authorized by Chapter 573, Acts of 1907, and is the result of an investigation and report made to the Legislature in May, 1911, by the Board of Railroad Commissioners and the Boston Transit Commission sitting jointly.

The subway is a double track tunnel for surface cars extending from the junction of Beacon street and Commonwealth avenue to and connecting with the Tremont street subway at a point nearly under Charles street. The greater part of the way it is a single barrel, but for a part of the distance it is a double barrel subway.

Work was begun on construction, March 18, 1912.

PRINCIPAL CONTRACTORS.

The Hugh Nawn Contracting Co.
Jones & Laughlin Steel Co.
Carnegie Steel Co.
Concrete Steel Co.
W. E. Clark & Co.
Lackawanna Steel Co.
William H. Perry Co.
Lewis F. Shoemaker & Co.
Levering & Garrigues Co.
Bethlehem Steel Co.
Emerson & Norris Co.
Simpson Brothers Corporation.
Coleman Brothers.
Warren Brothers Co.
Gleason & Berry.
Hecla-Winslow Co.
W. A. & H. A. Root, Inc.
The T. F. McGann & Sons Co.

CONSTRUCTION DATA.

Amount of concrete used, about 124,000 cubic yards.

Amount of earth excavated, about 383,000 cubic yards.

Amount of structural steel used, about 2,100 tons.

Amount of steel reinforcing rods used, about 6,500 tons.

Length to connection with subway near Carver street, including open incline near Kenmore street, 7,937 feet or about 1.5 miles.

Length on curves, about 2,506 feet, or about 32% of the length of the subway. Radii of curves vary from 400 to 5,000 feet.

Curvature, total deflection, 152 degrees.

Length wholly or partly under buildings, about 380 feet.

Greatest depth of bottom of structure below surface, about 39 feet, at Charlesgate East.

Greatest depth of top of rail below surface, about 34.5 feet.

About 5,400 lin. ft. of the structure rests on wooden piles or on concrete piers extending to the clay.

Inside width of subway where the two tracks are both in one tube, not less than 25 feet. Where the subway is divided by a center wall or by a line of columns the interior width of each portion is about 13 feet. The interior height above top of rail is not less than 14.75 feet.

Beginning at Kenmore street, 5% down for a distance of 212 feet; vertical curve, 240 feet; 3.2% down, 388 feet; vertical curve, 320 feet; 3.3% up, 664 feet; vertical curve, 160 feet; level, 774 feet (including Massachusetts station); vertical curve, 80 feet; 1.56% down, 682 feet; vertical

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curve, 100 feet; 0.25% down, 790 feet; vertical curve, 20 feet; level, 824 feet (including Copley station); vertical curve, 40 feet; 0.67% down, 950 feet; vertical curve, 40 feet; 0.22% down, 844 feet; vertical curve, 120 feet; 2.11% up, 372 feet; vertical curve, 100 feet; 1% up, 129 feet; thence on a vertical curve up to a 5% grade in the Old Subway.

Provision is made for ventilation from side chambers through gratings in the sidewalk at Fairfield street and at Berkeley street, and at the Fens through a vertical shaft. Provision is made to exhaust the air from the tunnel at these points by means of fans if it becomes necessary so to do. Emergency exits are also provided in connection with the ventilation outlets, these exits being about midway between stations.

The stations are provided with telephone booths, news stands and toilet rooms.

There are two stations, "Massachusetts" at Massachusetts avenue and "Copley" at Dartmouth street. The platforms of these stations are each 350 feet long and have an average width of 20 feet. The walls are finished with a wainscot of white terrazzo with a border of colored terrazzo and inlaid mosaic. The walls above the wainscot and the ceilings are finished with white cement plaster.

There are no floors, partitions, or sheathings of wood. With the exception of hand rails, entrance doors and window frames, no part of the structure is inflammable.

The Boylston street subway lies for its entire length within the filled area of the Back Bay district. Seventy per cent of its volume lies below the level of the ground water and for about one-third of its length it is wholly below the ground water level. The excavated material below the filling consisted of silt, sand and clay.

The subway has been constructed in about two and one-half years. Its total net cost will be, in round numbers, $4,500,000, including property taken for its construction.

Length of single track, 15,870 feet.

EQUIPMENT, ETC., BY THE BOSTON ELEVATED RAILWAY COMPANY.

Equipped with Union Switch and Signal Company's signals.

Rail used is 85 lb. A. S. C. E. section of T rail laid in broken stone ballast.

Cars will be run to the Boylston street subway from Beacon street, Brookline, Commonwealth avenue and the Newton-Brighton line running via Brighton and Commonwealth avenues.

Transfer privileges will be provided at Massachusetts Station so that passengers from inbound Ipswich street, Harvard Bridge, Cambridge, Cottage Farm Bridge or Commonwealth avenue cars not entering the subway may transfer to inbound cars in the subway and outbound cars running on the surface, including cars whose trips terminate at the junction of Boylston street and Massachusetts avenue, may transfer to outbound cars in the subway. Conversely, passengers arriving at Massachusetts Station may receive checks on inbound cars to transfer to inbound Boylston street cars or cars running on Massachusetts avenue toward Huntington avenue; outbound passengers to any outbound car running via Boylston street, Ipswich street, Beacon street or Harvard Bridge.

The present running time between the junction of Beacon street and Commonwealth avenue and Park street is about 16 minutes. The new running time will be about 9 minutes. This is a saving in a distance of about a mile and a half, of about 7 minutes in schedule time, under the most favorable conditions for operation, and of a much greater time when street congestion would cause delay.

All equipment running through this subway will be of the high speed, new all-steel, semi-convertible prepayment type of cars seating 52 passengers.

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APPENDIX B.

[SPECIAL ACT]

[CHAPTER 87.]

THE COMMONWEALTH OF MASSACHUSETTS.

In the Year One Thousand Nine Hundred and Fifteen.

AN ACT to authorize the Boston Transit Commission to pay the Cost of Certain Alterations in the Tremont Street Subway out of the Proceeds of Certain Bonds.

Be it enacted by the Senate and House of Representatives in General Court assembled and by the authority of the same, as follows:—

SECTION 1. The Boston transit commission is hereby authorized to pay the cost of the changes in the outlet of the ventilating chamber in the Tremont street subway, formerly under the sidewalk on Tremont street opposite the Wilbur theatre, to an amount not exceeding thirty-five hundred dollars out of the funds received from the sale of bonds issued under the provisions of chapter one hundred and eighty-seven of the acts of the year nineteen hundred and five, the amount so paid to be charged to the cost of the Tremont street subway.

SECTION 2. This act shall take effect upon its acceptance by the Boston Elevated Railway Company.

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APPENDIX C.

[SPECIAL ACT]

[CHAPTER 130.]

AN ACT TO AUTHORIZE THE BOSTON TRANSIT COMMISSION TO MAKE CONTRACTS FOR TEMPORARY USE OF PORTIONS OF THE DORCHESTER TUNNEL.

Be it enacted, etc., as follows:

SECTION 1. The Boston transit commission in the name and on behalf of the city of Boston may execute contracts in writing with the Boston Elevated Railway Company for the temporary use of such parts of the Dorchester tunnel as may from time to time be completed, on such terms as may be agreed upon by the Boston transit commission and the Boston Elevated Railway Company. Such contracts shall terminate when the use of said tunnel shall begin under the contract made on the seventh day of December, nineteen hundred and eleven, under and in accordance with the provisions of section three of Part I of chapter seven hundred and forty-one of the acts of the year nineteen hundred and eleven.

SECTION 2. This act shall take effect upon its passage. [*Approved March 8, 1915.*]

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APPENDIX D.

[SPECIAL ACT]

[CHAPTER 184.]

AN ACT TO ABOLISH THE TOLLS FOR THE USE OF THE EAST BOSTON TUNNEL.

Be it enacted, etc., as follows:

SECTION 1. The mayor and city council of the city of Boston shall appropriate annually until the tenth day of June, in the year nineteen hundred and twenty-two, from the tax levy a sum which, together with the rental received from the Boston Elevated Railway Company for the lease of the East Boston tunnel, shall be sufficient to meet the annual interest and sinking fund requirements of the bonds issued to pay for the construction of said tunnel. The sum necessary to be appropriated in each year from taxes for this purpose shall be determined by the sinking funds commissioners of said city, and shall be at least equal to the net amount of tolls collected in the preceding year. The amounts so determined by the sinking funds commissioners to be necessary shall be certified by them to the mayor, who shall include said amount in the annual budget or in a supplemental budget, and said amount shall not be reduced by the mayor or the city council. Upon the making of such an appropriation, the amount appropriated shall be paid to the sinking funds commissioners and shall be held by them, together with said rental received from the Boston Elevated Railway Company, to meet the principal and interest payments on the bonds issued for the construction of said tunnel. Upon such payment, the mayor shall issue an order in writing to the Boston Elevated Railway Company requiring that the collection of tolls for the use of said tunnel shall cease for a period of one year from the date when said appropriation is paid over to the sinking funds commissioners, and after the receipt of such order by said company no tolls shall be collected for the use of said tunnel for that year.

SECTION 2. The taxes assessed on property in the city of Boston, as provided by section fifty-three of Part I of chapter four hundred and ninety of the acts of the year nineteen hundred and nine, as amended by section one of chapter five hundred and twenty-one of the acts of the year nineteen hundred and ten, shall not exceed ten dollars and sixty cents instead of ten dollars and fifty-five cents as provided by said chapter five hundred and twenty-one.

SECTION 3. Chapter six hundred and sixty-seven of the acts of the year nineteen hundred and thirteen is hereby repealed.

SECTION 4. Any court having jurisdiction in equity, or any justice thereof, shall have jurisdiction in equity to enforce the provisions of this act.

SECTION 5. Any bondholder whose property is injured by the abolition of the East Boston tunnel tolls under this act, and who cannot agree with the city treasurer and the mayor as to the damages so sustained, may have the same determined by a jury in the superior court for the county of Suffolk on petition against the city of Boston filed in the office of the clerk of said court within one year after the passage of this act, and judgment shall be entered upon the determination of the jury, and costs shall be taxed and execution issued as in civil cases.

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The treasurer of the city, or the sinking funds commissioners may agree with any bondholder for the purchase and redemption, out of any funds available for the reduction of the city debt, of any bonds held by the bondholder.

SECTION 6. This act shall take effect on the thirty-first day of December, in the year nineteen hundred and fifteen, provided that it is accepted prior to that date by the mayor and city council of the city of Boston. [*Approved March 19, 1915.*]

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APPENDIX E.

[SPECIAL ACT]

[CHAPTER 270.]

AN ACT RELATIVE TO THE COMPENSATION FOR INJURIES TO WORKMEN AND MECHANICS IN THE EMPLOY OF THE BOSTON TRANSIT COMMISSION.

Be it enacted, etc., as follows:

SECTION 1. Section one of chapter six hundred and thirty-six of the acts of the year nineteen hundred and fourteen is hereby amended by inserting after the word "laborers," in the first and ninth lines, the words:—workmen and mechanics,—so as to read as follows:—*Section 1.* Laborers, workmen and mechanics employed by the Boston transit commission shall be deemed to be in the service of the city of Boston within the provisions of chapter eight hundred and seven of the acts of the year nineteen hundred and thirteen, and shall be entitled to the compensation provided for by that act. Such compensation shal lbe paid out of the proceeds of the rapid transit loans and shall be included in the net cost of the tunnel or subway in the construction of which such laborers, workmen and mechanics receive personal injuries arising out of and in the course of their employment.

SECTION 2. This act shall take effect upon its passage. [*Approved April 12, 1915.*]

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APPENDIX F.

[SPECIAL ACT]

[CHAPTER 293.]

AN ACT TO PROVIDE FOR THE CONSTRUCTION OF A TUNNEL OR SUBWAY IN THE CHARLESTOWN DISTRICT OF THE CITY OF BOSTON AND THE REMOVAL OF THE ELEVATED RAILWAY STRUCTURE IN SAID DISTRICT.

Be it enacted, etc., as follows:

SECTION 1. The Boston transit commission shall construct a tunnel or subway from a point at or near City square to a point at, near or beyond Sullivan square in the Charlestown district of the city of Boston, under the same provisions as to construction, payment and use that are provided by law for the construction, payment and use of the present tunnel under Washington street in the city of Boston.

SECTION 2. The present elevated structure now operated and maintained between City square and Sullivan square, along Main street, shall, upon the construction of the tunnel or subway herein provided for, be removed, the same being detrimental to the public welfare and a menace to public health, and the expense of the removal shall be considered a part of the cost of construction of said tunnel or subway.

SECTION 3. Upon the carrying out of the provisions aforesaid, the superior court for the county of Suffolk, upon petition of the city, company or any party in interest, shall appoint three commissioners who shall determine the damages, if any, sustained by the company over and above the benefit, if any, which the company receive by the carrying out of said provisions, and the damages so determined shall be paid by the city and considered a part of the cost of said tunnel or subway. The commissioners shall, within three years after the carrying out of the said provisions, determine the benefits, if any, received by the several parcels of real estate abutting on the parts of the streets from which said structure shall have been removed and shall assess upon every such parcel a betterment consisting of a proportionate part, not exceeding one half of the cost of carrying out the said provisions and not exceeding one-half of the benefit received by the parcel.

SECTION 4. The owners of parcels so assessed shall pay to the city each year one twenty-fifth of the amount assessed on their respective parcels, with interest at four per cent per annum on the part of the assessment remaining unpaid, and the amount of the rental to be paid by the company shall be reduced by the total amount of the assessments paid during the year. Any owner may pay the whole or any unpaid balance of his assessment, and in such case the city shall hold the same and use one twenty-fifth thereof each year in reduction of the rental.

SECTION 5. If any party in interest is dissatisfied with the determination of the commissioners, he or it may have damages or betterments determined by a jury or by a justice of said court on petition therefor filed in said court within one year after the determination; and all laws relating to the determination of damages and betterments for the laying out of highways in said city shall, so far as they may be applicable, govern in such matters under this act. [*Approved April 23, 1915.*]

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APPENDIX G.

[SPECIAL ACT]

[CHAPTER 297.]

AN ACT RELATIVE TO A SUBWAY STATION AT OR NEAR THE CORNER OF BOYLSTON AND ARLINGTON STREETS IN THE CITY OF BOSTON.

Be it enacted, etc., as follows:

SECTION 1. Section five of Part I of chapter seven hundred and forty-one of the acts of the year nineteen hundred and eleven is hereby amended by inserting after the word "square," in the eighteenth line, the words:—at or near the corner of Boylston and Arlington streets,—so that the first paragraph of said section will read as follows:—The commission shall construct in the city of Boston a subway (hereinafter called the Boylston street subway) so designed as to be adapted to contain two railway tracks, commencing with an open cut at or near the junction of Commonwealth avenue and Beacon street, thence continuing to, in, and under Commonwealth avenue, Charlesgate west, the Fenway, Charlesgate east, Newbury street, crossing under Massachusetts avenue; thence passing under or across private land and land of the city of Boston to a point under Boylston street near Hereford street; thence under Boylston street to a point at or near its junction with Arlington street; thence in and under public ways and public or private lands by such route as the commission may determine, to a point at or near the junction of Boylston street and Tremont street, and thence in or under Tremont street and public lands to a point at or near the Park street station of the Tremont street subway, together with stations at Massachusetts avenue, at Copley square, at or near the corner of Boylston and Arlington streets, at or near the corner of Boylston and Tremont streets, and at or near Park street. Instead of constructing said subway in a continuous line from Arlington street to Park street station, the commission may connect said subway at or near the junction of Boylston street and Tremont street with the tracks of the present Tremont street subway, and between that point and the Park street station may either enlarge the present Tremont street subway so as to provide for two additional tracks, or may construct a separate subway adapted to contain two railway tracks, connecting the same with the present Tremont street subway and the tracks located therein.

SECTION 2. This act shall take effect when accepted by the Boston Elevated Railway Company. [*Approved April 26, 1915.*]

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APPENDIX H.

[SPECIAL ACT]

[CHAPTER 376.]

AN ACT RELATIVE TO THE CONSTRUCTION OF ADDITIONAL TUNNELS OR SUBWAYS IN THE CITY OF BOSTON.

Be it enacted, etc., as follows:

SECTION 1. Section sixteen of chapter seven hundred and forty-one of the acts of the year nineteen hundred and eleven is hereby amended by adding at the end thereof the following:—The Commission may, in connection with any stations or terminals, provide means for a convenient interchange of passengers between the tunnels and subways and street railway lines, and for that purpose shall have all the powers conferred by this act, including the right to use public lands and highways, to take private property in the manner specified in this act and to widen highways where such widening is deemed necessary; and the commission may construct subways, inclines, approaches and other structures for the use of surface street railway cars and may grant locations for street railway lines, either upon the surface of land acquired for that purpose or in or upon any such subways, inclines, approaches or other structures so constructed, and may also grant such other locations upon the public highways as may be necessary to make connections with existing surface lines,—so as to read as follows:—*Section 16.* In connection with the construction of any tunnel or subway authorized by this act the commission may, for the purpose of avoiding objectionable curves or any practical or legal obstacles, vary or alter the routes herein respectively prescribed for the tunnels and subways, and for the said purposes may locate the tunnels, subways and stations or any of them, in whole or in part, on private or public lands. The commission may also, in connection with any tunnel or subway, construct such approaches, sidings, spur tracks, loops, entrances, inclines, elevators, connections and other structures as it may deem necessary. The commission may, with the consent of the company, make such alterations in the existing tunnels and subways, including stations and exits and entrances thereof, as it may deem necessary or advisable. The commission may, in connection with any stations or terminals, provide means for a convenient interchange of passengers between the tunnels and subways and street railway lines, and for that purpose shall have all the powers conferred by this act, including the right to use public lands and highways, to take private property in the manner specified in this act and to widen highways where such widening is deemed necessary; and the commission may construct subways, inclines, approaches and other structures for the use of surface street railway cars and may grant locations for street railway lines, either upon the surface of land acquired for that purpose or in or upon any such subways, inclines, approaches or other structures so constructed, and may also grant such other locations upon the public highways as may be necessary to make connections with existing surface lines.

SECTION 2. This act shall take effect upon its acceptance by the city council of the city of Boston, with the approval of the mayor, and by the Boston Elevated Railway Company by vote of its directors, and upon the filing of certificates of such acceptances with the secretary of the commonwealth within sixty days after the approval of this act by the governor. *Approved May 28, 1915.*]

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APPENDIX I.

The names of all the assistants in the Engineering Department who have been employed for more than one month during the last year, together with an indication of some of the work on which each has been engaged, are given below.

Assistant Engineers.

LEON N. ALBERTS,	Plans and studies, East Boston Tunnel Extension and Dorchester Tunnel.
CHARLES H. BARTLETT,	Detail work, designs for steel structures.
**BION A. BOWMAN,	Designs for steel and reinforced concrete structures.
C. LEONARD BROWN,	Construction, Sections B, C and E, Dorchester Tunnel.
JAMES D. BURNS,	Plans and studies, East Boston Tunnel Extension and Dorchester Tunnel.
FRANCIS V. CAREY,	Construction, Section 2, Boylston-street Subway; plans and surveys, Dorchester Tunnel.
WILBUR W. DAVIS,	In charge of surveys, plans and construction, Enlargement of Park-street station.
FREDERICK C. H. EICHORN,	Inspection, Section 5, Boylston-street Subway, and Section D, Dorchester Tunnel.
G. D. EMERSON,	In charge of construction, Sections B, C, D and E, Dorchester Tunnel.
ROBERT B. FARWELL,	In charge of surveys, plans and construction, East Boston Tunnel Extension; in charge of construction, Section H, Dorchester Tunnel.
JAMES B. FLAWS,	Plans, Dorchester Tunnel.
JAMES T. FRAME,	Construction, Sections 4 and 5, Boylston-street Subway; in charge of work, Section D, Dorchester Tunnel.
AUSTIN B. HENDERSON,	Plans for detail work, Dorchester Tunnel.
LEONARD B. HOWE,	Steel and concrete design, East Boston Tunnel Extension.
WILLIAM W. LEWIS,	In charge of surveys and plans and miscellaneous work, Dorchester Tunnel.
ROY M. LOTHROP,	Contract and detail plans, East Boston Tunnel Extension and Dorchester Tunnel.

** Given leave of absence.

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LAURENCE B. MANLEY,	In charge of construction, Boylston-street Subway, and interior finish in Washington, Bowdoin and Scollay Under stations.
CLARENCE D. MAYNARD,	Construction, Section H, East Boston Tunnel Extension, and Section H, Dorchester Tunnel.
PERCIVAL H. MOSHER,	Inspection, Sections B, C, D and H, Dorchester Tunnel, and Enlargement of Park-street Station.
PHILIP C. NASH,	Construction, Enlargement of Park-street Station.
GEORGE F. OWEN,	Line and grade work, Section D, Dorchester Tunnel; plans for Dorchester Tunnel.
LAURENCE M. PITMAN,	Line and grade work, Section 5, Boylston-street Subway, and Section D, Dorchester Tunnel.
ROLAND B. RAND,	Plans for steel details, Dorchester Tunnel and East Boston Tunnel Extension.
RALPH E. RICE,	Plans for station finish, Boylston-street Subway, Dorchester Tunnel and East Boston Tunnel Extension.
**BARZILLAI A. RICH,	Designs for structures, Dorchester Tunnel.
ERNEST R. SPRINGER,	Designs for steel and reinforced concrete structures and in charge of steel construction.
GEORGE H. STEARNS,	In charge of designs for steelwork and reinforced concrete structures.
HERBERT R. STEARNS,	Designs and plans, Dorchester Tunnel.
LEO S. STONE,	Interior finish of stations, Boylston-street Subway, Dorchester Tunnel and East Boston Tunnel Extension.
ROBERT K. TAYLOR,	Construction work, Sections B, C and E, Dorchester Tunnel.
PHILIP B. WALKER,	In charge of work at stockyards at Cypher street and at Canal street, also grouting work in East Boston Tunnel.

Draftsmen.

PAUL P. BANGS,	Blueprinting, assisting photographer, etc.
**CHARLES R. BERRY,	Plans, estimates, etc., Boylston-street Subway.
*FREDERICK C. FIGENBAUM,	Plans for station finish, Boylston-street Subway, East Boston Tunnel Extension and Dorchester Tunnel.
RALPH A. FISHER,	Details of steelwork, office and shop.
W. AUGUSTINE FORD,	Plans, Dorchester Tunnel.
GEORGE P. GOODMAN,	Drafting and photography.

* Left the employ of the Commission. ** Given leave of absence.

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SAMUEL C. LYMAN,	Steel construction, at Cypher-street stock-yard, for East Boston Tunnel Extension and Dorchester Tunnel.
CHARLES B. MCNALLY,	Plans, East Boston Tunnel Extension and Dorchester Tunnel.
*ROYAL L. MEAD,	Plans, Enlargement of Park-street Station.
EDMUND A. RICE,	Plans, East Boston Tunnel Extension and Enlargement of Park-street Station.
CHESTER A. RICHARDSON,	Plans and structural designs for Dorchester Tunnel.
FREDERIC W. STILES,	Boylston-street Subway.
LAURENCE E. WEEKS,	East Boston Tunnel Extension.
JOHN M. WISEMAN,	Plans for steel, Boylston-street Subway, Dorchester Tunnel and East Boston Tunnel Extension.

Assistants, Instrumentmen.

RICHARD A. CASWELL,	Line and grade work and force accounts, Section H, East Boston Tunnel Extension, and Section H, Dorchester Tunnel.
WILLIAM J. COCHRAN,	Line and grade work, Section G, East Boston Tunnel Extension.
HENRY L. CROCKER,	Line and grade work, Section 5, Boylston-street Subway, and Section D, Dorchester Tunnel.
LESTER S. DANIELS,	Line and grade work, Section H, East Boston Tunnel Extension, and Section H, Dorchester Tunnel.
HARRY R. DRAPER,	Design for steelwork and reinforced concrete, Dorchester Tunnel.
JOHN F. A. GIBLIN,	Sections B, C and D, Dorchester Tunnel.
CHARLES H. HARRINGTON,	Line and grade work, Sections B, C and E, Dorchester Tunnel.
JOHN A. HOLBROOK,	Line and grade work, Sections 4 and 5, Boylston-street Subway, Section B, Dorchester Tunnel, and Section G, East Boston Tunnel Extension.
ARTHUR V. LYNCH,	Line and grade work and care of work in basements, Sections B, C and E, Dorchester Tunnel.
RALPH C. MCPHERSON,	Plans and line and grade work, Dorchester Tunnel.
DANIEL G. MOSHER,	Line and grade work, Sections B, C and E, Dorchester Tunnel.
JAMES H. O'CONNOR,	Force accounts and pipe changes, Sections 4 and 5, Boylston-street Subway, and Sections G and H, East Boston Tunnel Extension.

* Left the employ of the Commission.

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WILLIAM J. POWER, JR.,	Line and grade work, Section 2, Boylston-street Subway; Station finish, Section B, Dorchester Tunnel, and Section H, East Boston Tunnel Extension.
**CHARLES V. REYNOLDS,	Boylston-street Subway, Dorchester Tunnel and East Boston Tunnel Extension.
HARRY H. THORBURN,	Line and grade work, Enlargement of Park-street Station.
SIDNEY S. VON LOESECKE,	Line and grade work, Enlargement of Park-street Station.
WILLIAM L. WRIGHT, JR.,	In charge of line and grade work, Sections B, C and E, Dorchester Tunnel.

Assistants, Rodmen.

*CHRISTOPHER A. CONNOR,	Line and grade work, Sections 2 and 4, Boylston-street Subway, and Enlargement of Park-street Station.
WILLIAM G. DOHERTY,	Line and grade work, Section 5, Boylston-street Subway, and Section D, Dorchester Tunnel.
JOHN P. FARRELL,	Line and grade work, Section H, East Boston Tunnel Extension, and Section H, Dorchester Tunnel.
**RAYMOND H. FELLOWS,	Section 2, Boylston-street Subway, Section B, Dorchester Tunnel, and Enlargement of Park-street Station.
W. ANTHONY FORD,	Plans, Dorchester Tunnel.
HARRY H. LYNN,	Line and grade work, Section H, East Boston Tunnel Extension, and Section D, Dorchester Tunnel.
MORA L. MILLER,	Line and grade work, Section H, East Boston Tunnel Extension, and Enlargement of Park-street Station.
*JOHN P. O'KEEFE,	Line and grade work and force accounts, Sections G and H, East Boston Tunnel Extension.
EDISON F. SAWYER,	Line and grade work, Section 5, Boylston-street Subway, and Sections C, D and E, Dorchester Tunnel.
MAX SILVERMAN,	Line and grade work, Enlargement of Park-street Station.

Inspectors.

JOSEPH E. CAHILL,	Inspecting concrete mixing for Sections 2 and 5, Boylston-street Subway, and for Sections B, C and D, Dorchester Tunnel.
MARTIN C. CHERRY,	Section G, East Boston Tunnel Extension, and Section H, Dorchester Tunnel.

* Left the employ of the Commission. ** Given leave of absence.

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*EDWIN A. DESMOND,	Section H, East Boston Tunnel Extension, and Enlargement of Park-street Station.
CHARLES L. DOHERTY,	Sections C and E, Dorchester Tunnel.
FRANK I. GARFIELD,	Section H, East Boston Tunnel Extension, and Sections B and H, Dorchester Tunnel.
JOSEPH J. JOLLEY,	Inspecting concrete mixing for Section H, East Boston Tunnel Extension, and for Sections C and E, Dorchester Tunnel.
THOMAS H. KEENAN,	Grouting, Section B, East Boston Tunnel.
PHILIP H. LADD,	Section H, East Boston Tunnel Extension, and Enlargement of Park-street Station.
HERBERT D. LEARY,	Section H, East Boston Tunnel Extension, and Section D, Dorchester Tunnel.
*HENRY M. MCBRIDE,	Inspecting concrete mixing for Section C, Dorchester Tunnel.
JOHN P. MCKNIGHT,	Section J incline, East Boston Tunnel Extension, and Enlargement of Park-street Station.
ROBERT P. O'KEEFE,	Sections 2 and 5, Boylston-street Subway, Sections G and H, East Boston Tunnel Extension, and Enlargement of Park-street Station.
ALFRED W. PARKER,	Inspector in charge of structural steelwork.
*ALFRED E. PERKINS,	Section 5, Boylston-street Subway, and Section D, Dorchester Tunnel.
JOSEPH E. REINHALTER,	Sections B, C and D, Dorchester Tunnel.
WILLIAM G. TONNER,	Section H, East Boston Tunnel Extension, and Section E, Dorchester Tunnel.
JOHN F. WATERS,	Inspecting concrete mixing for Sections C, D and H, Dorchester Tunnel.

Chemists, Testing Material, etc.

SETH M. BRYANT,	Testing cement.
HAROLD C. DELONG,	Chemist in charge of testing cement, asphalt and other materials.
JOHN W. SHORROCK,	Testing cement.

Clerical Force.

*HENRY F. BARKER,	Stenographer.
WILLIAM A. BICKFORD,	Clerk and bookkeeper at Cypher-street stockyard.
ARTHUR B. CARTER,	Secretary to the Chief Engineer.
HARRY E. CASEY,	Stenographer.
CHARLES E. FAY,	Messenger in drafting room, blueprinting, care of plans.

* Left the employ of the Commission.

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*JACOB L. GARBER,	Clerk at Cypher-street stockyard.
*JOHN L. F. KENNEDY,	Office boy.
FRANCIS J. KURRISS,	Clerk and stenographer.
THOMAS J. MULDOON,	Stenographer at Cypher-street stockyard.
THOMAS J. PETTIT,	Clerk and stenographer.
JOHN E. RYAN,	Stenographer.
JOSEPH P. SHEERIN,	Clerk.
FRANK A. SMITH,	Clerk and bookkeeper at stockyards.

* Left the employ of the Commission.

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APPENDIX K.

CANVASS OF BIDS FOR CONSTRUCTING TWO ENTRANCES TO DARTMOUTH STREET LOBBY OF THE COPLEY STATION, BOYLSTON STREET SUBWAY. JULY 21, 1914.

BIDDER.	Milford granite.		Stony Creek granite.		Deer Isle granite.	
	Amount.	Time of Completion.	Amount.	Time of Completion.	Amount.	Time of Completion.
Deacon Brothers, Quincy, Mass.	$9,540.00	October 1, 1914.	$9,650.00	October 1, 1914.	$8,800.00	October 1, 1914.
The Norcross Brothers Co., 73 Tremont Street, Boston, Mass.	8,960.00	In 12 weeks.	8,460.00	In 10 weeks.	No bid.	...
W. A. & H. A. Root, Inc., 1 Beacon Street, Boston, Mass.	8,338.00	September 12, 1914.	8,338.00	September 12, 1914.	7,440.00	August 31, 1914.

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APPENDIX M.

CANVASS OF BIDS FOR FURNISHING AND SETTING COPPER COVERED DOORS AND WINDOWS WITH COPPER COVERED FRAMES IN STATIONS OF THE BOYLSTON STREET SUBWAY. AUGUST 4, 1914.

BIDDER.	7 Doors (Type A.)	13 Doors (Type B).	5 Doors (Type C).	4 Doors (Type D).	5 Double Hung Windows.	Total.	Time of Completion.
S. D. Hicks & Son,	$66.00	$71.00	$71.00	$56.00	$133.00		
9 Bowker Street, Boston, Mass.....	462.00	923.00	355.00	224.00	665.00	$2,629.00	September 24, 1914.
E. B. Badger & Sons Co.,	58.00	62.00	60.00	54.00	100.00		
75 Pitts Street, Boston, Mass.....	406.00	806.00	300.00	216.00	500.00	2,228.00	September 14, 1914.
American Kalamein Works,	55.00	60.00	58.00	44.00	95.00		
6 Beacon Street, Boston, Mass.....	385.00	780.00	290.00	176.00	475.00	2,106.00	August 30, 1914.
Boston Metal Fireproofing Co.,	53.00	55.00	51.60	41.75	93.40		
8 Beacon Street, Boston, Mass.....	371.00	715.00	258.00	167.00	467.00	1,978.00	In 6 weeks.
E. Van Noorden & Company,	38.00	43.00	42.00	35.00	108.00		
100 Magazine Street, Roxbury, Mass...	266.00	559.00	210.00	140.00	540.00	1,715.00	In 30 days.

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APPENDIX N.

CANVASS OF BIDS FOR FURNISHING 150 TONS OF DEFORMED OPEN-HEARTH STEEL REINFORCING RODS EQUAL IN SECTION TO ¾-INCH SQUARE, DELIVERED F. O. B. CARS BOSTON, VIA N. Y., N. H. & H. R. R., CYPHER STREET SIDING. RODS TO BE 36 FEET LONG, PLUS OR MINUS ONE INCH. AUGUST 6, 1914.

BIDDER.	Kind of Rod.	Amount.	Time of Shipment.
Carnegie Steel Company, 120 Franklin Street, Boston, Mass.	Square cold-twisted.	$27.60 4,140.00	In 1 week to 10 days.
Guy S. Leavitt, 70 Kilby Street, Boston, Mass.	Square cold-twisted.	27.10 4,065.00	In 3 days.
Corrugated Bar Company, 220 Devonshire Street, Boston, Mass.	Square corrugated.	26.60 3,990.00	Shipment from mill in 3 weeks from receipt of order.
Jones & Laughlin Steel Company, 131 State Street, Boston, Mass.	Cold-twisted or Jones & Laughlin diamond.	*26.60 3,990.00	In 1 week.
Concrete Steel Company, 7 Water Street, Boston, Mass.	Square Havemeyer.	26.40 3,960.00	In 1 week.
Charles Essensa & Company, 70 Kilby Street, Boston, Mass.	Square Slick.	26.10 3,915.00	In 2 days.

* One-half of 1 per cent. for cash in 10 days.

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* One-half of 1 per cent. for cash in 10 days.

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APPENDIX Q.

CANVASS OF BIDS FOR FURNISHING LABOR AND ALL MATERIALS (EXCEPT STEEL RODS, MATERIALS FOR WATERPROOFING AND IRON GRATING OVER SUBWAY VENTILATING SHAFT, FURNISHED BY BOSTON TRANSIT COMMISSION) FOR CHANGES IN VENTILATING SHAFT NEAR WILBUR THEATER, TREMONT STREET. AUGUST 19, 1914.

BIDDER.	Amount.	Time of Completion.
Coleman Brothers, 1 Marginal Street, Chelsea, Mass.	$2,425.00	Not stated.
Hugh Nawn Contracting Co., 82 Savin Street, Roxbury, Mass.	2,000.00	In Two weeks.

APPENDIX R.

CANVASS OF BIDS FOR FURNISHING AND INSTALLING A NEW BOILER AND RADIATORS IN THE ESTATE ON THE WESTERLY CORNER OF SUMMER AND CHAUNCY STREETS, BOSTON. SEPTEMBER 1, 1914.

BIDDER.	Amount.	Time of Completion.
Lynch & Woodward, 26–28 Beach Street, Boston, Mass.	$886.00	Not stated.
Walworth-English-Flett Co., 100 Pearl Street, Boston, Mass.	775.00	In 18 days.
Ingalls & Kendricken, Inc., 80 Sudbury Street, Boston, Mass.	696.00	In 15 days.

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APPENDIX S.

CANVASS OF BIDS FOR FURNISHING LABOR AND MATERIALS REQUIRED FOR BRONZE AND OTHER METAL WORK FOR TWO ENTRANCES TO DARTMOUTH STREET LOBBY, COPLEY STATION, BOYLSTON STREET SUBWAY. SEPTEMBER 2, 1914.

BIDDER.	Amount.	Time of Completion.
Hecla-Winslow Company, Inc., 101 Park Avenue, New York City	$4,490.00	December 1, 1914.
E. B. Badger & Sons Company, 75 Pitts Street, Boston, Mass.	3,389.00	December 1, 1914.
John Williams, Inc., 556 West 27th Street, New York City	3,300.00	November 15, 1914.
The T. F. McGann & Sons Company, 114 Portland Street, Boston, Mass.	3,090.00	November 10, 1914.

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APPENDIX T.

CANVASS OF BIDS FOR FURNISHING AND ERECTING OAK HANDRAILS COMPLETE WITH BRONZE BRACKETS AND CAST IRON POSTS, IN BOYLSTON STREET SUBWAY STATIONS. SEPTEMBER 3, 1914.

BIDDER.	770 lin. ft. 2-inch handrail.	480 lin. ft. 2½-inch handrail.	160 bends of 2-inch handrail.	102 bends of 2½-inch handrail.	225 brass brackets.	78 brass sockets.	106 cast iron posts.	Total.	Time of Completion.
	Item a	b	c	d	e	f	g		
Isaac McLean Sons Company, 292 Dorchester Street, South Boston, Mass.	$1.05 808.50	$1.05 504.00	$3.00 480.00	$3.00 306.00	$3.15 708.75	$2.15 167.70	$6.10 646.60	$3,621.55	Not stated.
A. Dickey & Company, 37 Bristol Street, Boston, Mass.	0.35 269.50	0.45 216.00	1.00 160.00	1.00 102.00	2.80 630.00	2.60 202.80	9.50 1,007.00	2,587.30	Not stated.
O. H. Drisko & Son, 166 Devonshire Street, Boston, Mass.	0.33 254.10	0.39 187.20	1.38 220.80	1.65 168.30	2.97 668.25	2.55 198.90	5.70 604.20	2,301.75	In 40 working days.

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APPENDIX U.

CANVASS OF BIDS FOR FURNISHING AND SETTING WHITE GLAZED TILE ON THE SUBWAY WALL IN THE ENLARGEMENT OF PARK STREET STATION. OCTOBER 3, 1914.

BIDDER.	Furnishing about 9,000 standard quality tile 9″x 4½″x ½″.	Furnishing about 9,000 first quality tile 9″x 4½″x ½″.	Furnishing about 9,000 tile 9″x 4½″x 1″.	Furnishing about 9,000 Grueby tile.	Furnishing and laying 275 sq. yds. standard quality tile.	Furnishing and laying 275 sq. yds. first quality tile.	Furnishing and laying 275 sq. yds. tile 9″x 4½″x 1″.	Furnishing and laying 275 sq. yds. Grueby tile.
Waldo Brothers, 45 Batterymarch Street, Boston, Mass.....	$102.00 per M.	$123.00 per M.	No bid.	No bid.	$5.58 per sq. yd.	$6.32 per sq. yd.	No bid.	No bid.
Tyler-Wires Company, 120 Boylston Street, Boston, Mass.....	$84.00 per M.	No bid.	$120.00 per M.	$204.00 per M.	$5.51 per sq. yd.	No bid.	$6.41 per sq. yd.	$9.35 per sq. yd.

In all cases time of delivery, 8 weeks from award of contract, and date of completion for laying tile, from two to three weeks after delivery.

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APPENDIX V.

CANVASS OF BIDS FOR FURNISHING MATERIALS FOR AND PLASTERING PORTIONS OF THE WALLS AND CEILINGS IN THE WASHINGTON STATION OF THE DORCHESTER TUNNEL. OCTOBER 6, 1914.

BIDDER.	800 sq. yds. plaster backing, about 1¼ inches thick.	7,200 sq. yds. grey Portland cement plaster, about ¼ inch thick.	8,000 sq. yds. white Portland cement plaster, ⅛ inch to ¼ inch thick.	100 sq. yds. grey finish plastering.	10,000 lin. ft. arrises and exterior corners, ¼ inch radius.	Filling 100 lin. ft. of grooves in ceiling with Portland cement mortar.	Total.
	Item 1	2	3	4	5	6	
Patrick Coffey, 46 Cornhill, Boston, Mass.	$0.75 600.00	$0.70 5,040.00	$0.55 4,400.00	$0.85 85.00	$0.08 800.00	$0.10 10.00	$10,935.00
Muir Bros. Company, 201 Devonshire Street, Boston, Mass.	0.70 560.00	0.51 3,672.00	0.47 3,760.00	0.75 75.00	0.10 1,000.00	0.10 10.00	9,077.00
Robert Gallagher Company, 166 Devonshire Street, Boston, Mass.	0.78 624.00	0.44 3,168.00	0.45 3,600.00	0.80 80.00	0.12 1,200.00	0.12 12.00	8,684.00
Keith & Craffey, 816 Old South Building, Boston, Mass.	0.65 520.00	0.40 2,880.00	0.35 2,800.00	0.50 50.00	0.05 500.00	0.10 10.00	6,760.00

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APPENDIX W.

CANVASS OF BIDS FOR FURNISHING AND SETTING RIBBED TILE AND PUTTING ON PLASTER FOR STRAIGHTENING WALLS IN THE WASHINGTON STATION OF THE DORCHESTER TUNNEL. OCTOBER 8, 1914.

BIDDER.	1,500 sq. yds. split terra cotta ribbed tile, 2″ thick.	500 sq. yds. partition made of 12″ x 12″ x 4″ terra cotta blocks.	100 sq. yds. partition made of 12″ x 12″ x 6″ terra cotta blocks.	900 sq. yds. cement plaster, ¼″ to ⅜″ thick.	100 sq. yds. cement plaster, ½″ to 1½″ thick.	Total.	Time of Completion.
	Item 1	2	3	4	4a		
Crowley & Hickey, 1140 Columbus Avenue, Boston, Mass.	$1.86 2,790.00	$1.56 780.00	$1.74 174.00	$0.78 702.00	$0.81 81.00	$4,527.00	November 17, 1914.
Michael D. Russo, 16 North Square, Boston, Mass.	1.20 1,800.00	1.46 730.00	2.05 205.00	0.65 585.00	1.30 130.00	3,450.00	Not stated.
Robert Gallagher Co., 166 Devonshire Street, Boston, Mass.	1.175 1,762.50	1.355 677.50	1.47 147.00	0.68 612.00	1.30 130.00	3,329.00	Not stated.
Gleason & Berry, 67 Cabot Street, Roxbury, Mass.	1.20 1,800.00	1.40 700.00	1.65 165.00	0.65 585.00	0.70 70.00	3,320.00	In 6 weeks.
Keith & Craffey, 816 Old South Building, Boston, Mass.	1.02 1,530.00	1.20 600.00	1.50 150.00	0.60 540.00	0.70 70.00	2,890.00	In 5 weeks.
Pennsylvania Tile & Construction Company, 201 Devonshire Street, Boston, Mass.	0.75 1,125.00	1.08 540.00	1.26 126.00	0.65 585.00	0.80 80.00	2,456.00	November 5, 1914.

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APPENDIX X.

CANVASS OF BIDS FOR FURNISHING THE MATERIALS FOR AND LAYING ASPHALT AND WOOD BLOCK PAVEMENT ON A CONCRETE BASE NEAR THE CORNER OF MASSACHUSETTS AVENUE AND NEWBURY STREET. OCTOBER 15, 1914.

BIDDER.	Removing, teaming and piling existing granite blocks, excavating to sub-grade, rolling and otherwise preparing 1,050 sq. yds. of site for concrete base.	900 sq. yds. of concrete base, 6 inches thick.	20 cu. yds. of concrete base, less than 6 inches in thickness, on top of old base.	600 sq. yds. of asphalt pavement, 3 inches thick.	450 sq. yds. of wood block pavement.	Total.	Time of Completion.
	Item a	b	bb	c	d		
Central Construction Co., 6 Beacon Street, Boston, Mass.....	$0.40 420.00	$1.00 900.00	$10.00 200.00	$1.50 900.00	$2.80 1,260.00	$3,680.00	In 20 days.
Coleman Brothers, 1 Marginal Street, Chelsea, Mass.....	0.30 315.00	0.80 720.00	7.00 140.00	2.00 1,200.00	2.50 1,125.00	3,500.00	Not stated.
James Doherty, 133 Calumet Street, Roxbury, Mass.	0.17 178.50	0.81 729.00	5.00 100.00	1.70 1,020.00	2.54 1,143.00	3,170.50	In 3 weeks.

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APPENDIX Y.

CANVASS OF BIDS FOR FURNISHING 650 TONS OF DEFORMED REINFORCING RODS EQUAL IN SECTION TO 1 INCH SQUARE, AND 50 TONS EQUAL IN SECTION TO 1¼ INCH SQUARE, DELIVERED F. O. B. CARS BOSTON, VIA N. Y., N. H. & H. R. R., CYPHER STREET SIDING. RODS TO BE 36 FEET LONG, PLUS OR MINUS 1 INCH. NOVEMBER 4, 1914.

BIDDER.	Kind of Rod.	Price per ton of 2,000 lbs.	Total.	Time of Shipment.
Charles Essensa & Co., 70 Kilby St., Boston, Mass.....	Slick.	$25.80	$18,060.00	Begin in 2 days.
Concrete Steel Products Co., 7 Water Street, Boston, Mass.....	Havemeyer.	25.60	17,920.00	During week of Nov. 16, 1914.
Cambria Steel Company, 101 Tremont St., Boston, Mass.....	Slick.	25.60	17,920.00	Finish in 5 days.
Corrugated Bar Company, 220 Devonshire St., Boston, Mass.....	Square corrugated.	25.40	17,780.00	Finish in 10 days.
Jones & Laughlin Steel Co., 131 State St., Boston, Mass.....	Diamond.	25.05	17,535.00	Finish in 1 week.

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APPENDIX Z.

CANVASS OF BIDS FOR FURNISHING AND PLACING WALL FINISH IN THE WASHINGTON STATION OF THE DORCHESTER TUNNEL. NOVEMBER 17, 1914.

BIDDER.	1,700 sq. yds. white terrazzo.	300 sq. yds. dull red terrazzo for borders.	230 sq. yds. ceramic title for borders and name panels.	140 sq. yds. grey Portland cement plaster, 1½" thick, for advertising panels.	Total.	Time of Completion.	
						All of the upper 4-inch dull red terrazzo border.	Remainder of work.
	Item a	b	c	d			
New England Marble Mosaic Coöperative Company, 147–155 Orleans Street, East Boston, Mass.	$5.50 9,350.00	$5.75 1,725.00	$6.30 1,449.00	$1.00 140.00	12,664.00	In 3 weeks.	In 10 weeks.
Waldo Brothers, 45–49 Batterymarch Street, Boston, Mass.	5.63 9,571.00	6.00 1,800.00	4.65 1,069.50	0.90 126.00	12,566.50	In 3 weeks.	In 14 weeks.
Galassi Mosaic & Tile Company, 5 Ash Street, Boston, Mass.	4.68 7,956.00	4.68 1,404.00	7.50 1,725.00	1.00 140.00	11,225.00	In 4 weeks.	In 4 weeks.
DePaoli Mosaic Association, 19 Damrell Street, South Boston, Mass.	3.78 6,426.00	4.23 1,269.00	4.50 1,035.00	1.00 140.00	8,870.00	In 3 weeks.	In 8 weeks.

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APPENDIX AA.

CANVASS OF BIDS FOR REMOVING OVAL COVERING OF EXIT FROM THE EAST BOSTON TUNNEL AT SCOLLAY SQUARE, IN FRONT OF No. 65 COURT STREET. (BUILDING TO BE REMOVED WITHIN THREE WEEKS FROM TIME OF NOTIFICATION.) NOVEMBER 24, 1914.

BIDDER.	Will remove the building and pay the Boston Transit Commission.
William G. Greene & Sons, 26 Hampshire Street, Cambridge, Mass.	$35.00
Swift Contracting Company, 70 Devonshire Street, Boston, Mass.	85.00

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APPENDIX CC.

CANVASS OF BIDS FOR FURNISHING AND SETTING RIBBED TILE AND PUTTING ON PLASTER FOR STRAIGHTENING WALLS IN THE SCOLLAY UNDER STATION OF THE EAST BOSTON TUNNEL EXTENSION. DECEMBER 17, 1914.

BIDDER.	600 sq. yds. split terra cotta ribbed tile, 2" thick.	200 sq. yds. Portland cement plaster, ½" to ¾" thick.	100 sq. yds. Portland cement plaster, ¾" to 1½" thick.	Total.	Time of Completion.
	Item 1	2	3		
Pennsylvania Tile & Construction Company, 201 Devonshire Street, Boston, Mass.	$1.18 708.00	$0.35 70.00	$0.055 5.50	$783.50	In 5 weeks.
Keith & Craffey, 816 Old South Building, Boston, Mass.	0.94 564.00	0.65 130.00	0.80 80.00	774.00	In 15 days.
Robert Gallagher Company, 166 Devonshire Street, Boston, Mass.	0.95 570.00	0.58 116.00	0.80 80.00	766.00	In 2 weeks.
Martin Gleason & Son, 67 Cabot Street, Boston, Mass.	0.90 540.00	0.55 110.00	0.65 65.00	715.00	In 3 weeks.
Isaac Blair & Company, Inc. 433 Harrison Avenue, Boston, Mass.	0.90 540.00	0.30 60.00	0.60 60.00	660.00	Jan. 9, 1915.

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APPENDIX DD.

CANVASS OF BIDS FOR CAST IRON BASE PLATES FOR SAFETY TREADS FOR STAIRWAYS IN THE WASHINGTON STATION OF THE DORCHESTER TUNNEL. JANUARY 12, 1915.

BIDDER.	Amount.	Time of Completion.	Remarks.
L. M. Ham & Company, 158 Portland Street, Boston, Mass.	$930.00	In 39 working days.	
Wollaston Foundry Company, 185 Summer Street, Boston, Mass.	749.86	In 30 working days.	Delivery to commence in 10 days.
G. W. & F. Smith Iron Co., Gerard Street, Roxbury, Mass.	749.00	Not stated.	Bid received at 4:45 P. M. instead of at noon.
Milford Iron Foundry, Milford, Mass.	704.89 0.0325 per lb.	Quickly.	
Puritan Iron Works, 110 Portland Street, Boston, Mass.	670.00	In 6 weeks if $10 a day overtime clause is retained; otherwise, in 30 days.	Delivery to commence in about 10 days.

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APPENDIX EE.

CANVASS OF BIDS FOR ALTERATIONS AND ADDITIONS TO BUILDING NUMBERED 53 SUMMER STREET, BOSTON. JANUARY 14, 1915.

BIDDER.	Total price.	Deduction if certain sash and frames are omitted.
William Crane, Amherst and Hayward Streets, Cambridge, Mass.	$14,997.00	$45.00
Tyler-Wires Company, 120 Boylston Street, Boston, Mass.	13,411.00	...
G. M. Davis & Company, 46 Cornhill, Boston, Mass.	11,300.00	...
M. S. Kelliher, 443 Neponset Avenue, Neponset, Mass.	10,609.00	100.00
M. J. Fish & Son, 114 State Street, Boston, Mass.	9,950.00	190.00
James E. Nelson Company 51 Beverly Street, Boston, Mass.	8,630.00	...

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APPENDIX HH.

CANVASS OF BIDS FOR FURNISHING AND ERECTING ABOUT 206 LINEAR FEET OF OAK HANDRAILS 2 INCHES IN DIAMETER, AND ABOUT 144 LINEAR FEET 2½ INCHES IN DIAMETER, INCLUDING BRASS BRACKETS AND SOCKETS AND CAST IRON POSTS, IN THE PARK STREET STATION OF THE TREMONT STREET SUBWAY. FEBRUARY 4, 1915.

BIDDER.	Amount.
A. Dickey & Company, 37 Bristol Street, Boston, Mass.	$722.50
O. H. Drisko & Son, 166 Devonshire Street, Boston, Mass.	555.00

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APPENDIX II.

CANVASS OF BIDS FOR BUYING TWO LOTS OF SCRAP IRON STORED AT NO. 14 CYPHER ST., SOUTH BOSTON, MASS. FEBRUARY 6, 1915.

BIDDER.	Lot 1. About 150 tons scrap beam ends, plates, angles, old girders, etc.		Lot 2. About 10 tons scrap rods, punchings, chips, etc.		Total.
	Price per 100 lbs.	Amount.	Price per 100 lbs.	Amount.	
Roxbury Iron & Metal Company, 140 Granite Avenue, Dorchester, Mass.	$0.30	$900.00	$0.275	$55.00	$955.00
H. Aronofsky & Sons, 601 Commercial Street, Boston, Mass.	0.265	795.00	0.265	53.00	848.00
Thos. Butler & Company, 23 Medford Street, Boston, Mass.	0.2625	787.50	0.2625	52.50	840.00
Perry, Buxton, Doane Company, 214 West First Street, South Boston, Mass.	0.24	720.00	0.335	67.00	787.00
William S. Nolan, 105 Falcon Street, East Boston, Mass.	0.20	600.00	0.35	70.00	670.00
Swift Contracting Company, 70 Devonshire Street, Boston, Mass.	0.19	570.00	0.36	72.00	642.00

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APPENDIX JJ.

CANVASS OF BIDS FOR FURNISHING AND ERECTING OAK HANDRAILS IN THE WASHINGTON STATION OF THE DORCHESTER TUNNEL. FEBRUARY 9, 1915.

BIDDER.	400 lin. ft. 2 inch oak rail.	350 lin. ft. 2½ inch oak rail.	102 bends of 2 inch oak rail.	84 bends of 2½ inch oak rail.	92 bronze brackets.	62 bronze sockets.	80 cast iron posts.	Total.	Time of Completion.
	Item a	b	c	d	e	f	g		
Wm. Hall & Company, 10 Dock Square, Boston, Mass.	$0.42 168.00	$0.57 199.50	$2.31 235.62	$2.38 199.92	$3.20 294.40	$3.03 187.86	$7.48 598.40	$1,883.70	In 2 months.
*O. H. Drisko & Son, 166 Devonshire Street, Boston, Mass.	0.34 136.00	0.40 140.00	1.45 147.90	1.70 142.80	2.85 262.20	2.50 155.00	6.10 488.00	1,471.90	March 11, 1915.
Anderson & Letteney, 21 Wareham Street, Boston, Mass.	0.30 120.00	0.40 140.00	0.35 35.70	1.00 84.00	2.85 262.20	2.60 161.20	7.60 608.00	1,411.10	March 20, 1915.

* Awarded to.

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APPENDIX KK.

CANVASS OF BIDS FOR FURNISHING 1,700 TONS OF DEFORMED REINFORCING RODS, DELIVERED F. O. B. CARS, BOSTON, VIA N. Y., N. H. & H. R. R., CYPHER STREET SIDING. DELIVERY TO BE MADE AT THE RATE OF 400 TONS PER MONTH, COMMENCING THE LATTER PART OF MARCH, 1915. FEBRUARY 9, 1915.

BIDDER.	25 tons equal in section to ½ inch square.	275 tons equal in section to ¾ inch square.	700 tons equal in section to 1 inch square.	700 tons equal in section to 1¼ inch square.	Total.	Kind of rod.	Delivery.
Cambria Steel Company, 60 State Street, Boston, Mass.....	$28.78 719.50	$26.78 7,364.50	$26.78 18,746.00	$26.78 18,746.00	$45,576.00	Not stated.	As stipulated above.
Corrugated Bar Company, 220 Devonshire Street, Boston, Mass.....	27.78 694.50	25.78 7,089.50	25.78 18,046.00	25.78 18,046.00	43,876.00	Square corrugated.	As stipulated above.
Jones & Laughlin Steel Company, 131 State Street, Boston, Mass.....	*27.78 694.50	*25.78 7,089.50	*25.78 18,046.00	*25.78 18,046.00	*43,876.00	Diamond.	As stipulated above, or earlier if desired.
Trussed Concrete Steel Company, 141 Milk Street, Boston, Mass.....	25.78 644.50	25.78 7,089.50	25.78 18,046.00	25.78 18,046.00	43,826.00	Rib.	As stipulated above.
Concrete Steel Company, 7 Water Street, Boston, Mass.....	27.60 690.00	25.60 7,040.00	25.60 17,920.00	25.60 17,920.00	43,570.00	Havemeyer.	As stipulated above, or entire shipment in 1 week from receipt of order.
Chas. Essensa & Company, 70 Kilby Street, Boston, Mass.....	*25.30 632.50	*25.30 6,957.50	*25.30 17,710.00	*25.30 17,710.00	*43,010.00	Square Slick.	As stipulated above.

* One-half per cent discount for cash in 10 days from date of shipment.

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APPENDIX LL.

CANVASS OF BIDS FOR FURNISHING AND SETTING RIBBED TILE AND PUTTING ON PLASTER FOR STRAIGHTENING WALLS IN THE BOWDOIN STATION OF THE EAST BOSTON TUNNEL EXTENSION. FEBRUARY 18, 1915.

BIDDER.	1500 sq. yds. split terra cotta ribbed tile, 2" thick.	50 sq. yds. 12"x 12"x 4" terra cotta blocks.	500 sq. yds. cement plaster ¼" to ¾" thick.	100 sq. yds. cement plaster ¾" to 1¼" thick.	Total.	Time of Completion.
	Item 1	2	3	3a		
National Fireproofing Company, 120 Franklin Street, Boston, Mass.	$1.35 2,025.00	$1.30 65.00	$0.50 250.00	$0.60 60.00	2,400.00	March 31, 1915.
Pennsylvania Tile & Construction Company, 201 Devonshire Street, Boston, Mass.	1.30 1,950.00	1.10 55.00	0.15 75.00	0.25 25.00	2,105.00	In 3 weeks.
Michael D. Russo, 16 North Square, Boston, Mass.	1.10 1,650.00	1.24 62.00	0.55 275.00	0.65 65.00	2,052.00	
Isaac Blair & Company, Inc., 433 Harrison Avenue, Boston, Mass.	0.95 1,425.00	2.00 100.00	0.40 200.00	0.80 80.00	1,805.00	March 18, 1915.
Patrick T. Brown, 813 Columbus Avenue, Boston, Mass.	0.90 1,350.00	0.90 45.00	0.60 300.00	0.70 70.00	1,765.00	In 1 month.
Keith & Craffey, 816 Old South Building, Boston, Mass.	0.82 1,230.00	1.08 54.00	0.65 325.00	0.80 80.00	1,689.00	In 25 working days.
Coleman Brothers, 1 Marginal Street, Chelsea, Mass.	0.88 1,320.00	1.40 70.00	0.36 180.00	0.70 70.00	1,640.00	March 15, 1915.

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APPENDIX MM.

CANVASS OF BIDS FOR FURNISHING AND SETTING SOFT STEEL FENCES FOR STAIRS IN THE ENLARGEMENT OF PARK STREET STATION. FEBRUARY 18, 1915.

BIDDER.	Amount.	Time of Completion.
Norfolk Iron Company, Norfolk Downs, Mass.....	$1,090.00	In 4 weeks.
L. E. Sanborn Company, 12 Elkins Street, South Boston, Mass.....	827.00	Not stated.
Oliver Whyte Company, 21 Cornhill, Boston, Mass.....	697.00	In 3 weeks.
G. W. & F. Smith Iron Company, Gerard Street, Roxbury, Mass.....	596.00	In 5 to 6 weeks.

APPENDIX NN.

CANVASS OF BIDS FOR FURNISHING AND DELIVERING 498 CAST IRON BASE PLATES FOR SAFETY TREADS FOR STAIRWAYS OF THE SCOLLAY UNDER AND BOWDOIN STATIONS OF THE EAST BOSTON TUNNEL EXTENSION. FEBRUARY 23, 1915.

BIDDER.	Amount.	Time of Delivery.
Milford Iron Foundry, Milford, Mass.....	$750.00	Can begin work at once and make frequent deliveries to suit.
Wollaston Foundry Company, Norfolk Downs, Quincy, Mass.....	730.00	Within thirty days from receipt of order.

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APPENDIX PP.

CANVASS OF BIDS FOR FURNISHING AND PLACING WALL FINISH IN SCOLLAY UNDER STATION OF THE EAST BOSTON TUNNEL EXTENSION. MARCH 11, 1915.

BIDDER.	886 sq. yds. of white terrazzo.	183 sq. yds. of crimson and white ceramic tile for borders and name panels.	100 sq. yds. of preliminary plaster in excess of 1 inch in thickness for straightening walls.	Total.	Time of Completion.
	Item a	b	c		
L. L. Rinaldi & Company, 263 Atlantic Ave., Boston, Mass.	$6.66 5,900.76	$6.66 1,218.78	$0.95 95.00	7,214.54	June 5, 1915.
New England Marble Mosaic Co-operative Co., 147–155 Orleans Street, East Boston, Mass.	5.20 4,607.20	8.90 1,628.70	0.78 78.00	6,313.90	Not stated.
Waldo Brothers, 45 Batterymarch Street, Boston, Mass.	4.85 4,297.10	10.08 1,844.64	0.20 20.00	6,161.74	Not stated.
Galassi Mosaic & Tile Company, 5 Ash Street, Boston, Mass.	5.22 4,624.92	7.25 1,326.75	0.90 90.00	6,041.67	In 8 weeks.
DePaoli Mosaic Association, 19 Damrell Street, South Soston, Mass.	4.32 3,827.52	8.73 1,597.59	0.75 75.00	5,500.11	In 5 weeks.

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APPENDIX QQ.

CANVASS OF BIDS FOR FURNISHING AND PLACING WALL FINISH IN BOWDOIN STATION OF THE EAST BOSTON TUNNEL EXTENSION. MARCH 11, 1915.

BIDDER.	845 sq. yds. of white terrazzo.	130 sq. yds. of blue and white ceramic tile for borders and name panels.	50 sq. yds. of preliminary plaster in excess of 1 inch in thickness for straightening walls.	Total.	Time of Completion.
	Item a	b	c		
L. L. Rinaldi & Company, 263 Atlantic Avenue, Boston, Mass.	$6.66 5,627.70	$6.66 865.80	$0.95 47.50	$6,541.00	June 5, 1915.
New England Marble Mosaic Co-operative Co., 147–155 Orleans Street, East Boston, Mass.	5.40 4,563.00	8.95 1,163.50	0.80 40.00	5,766.50	April 30, 1915
Waldo Brothers, 45 Batterymarch Street, Boston, Mass.	4.85 4,098.25	10.08 1,310.40	0.20 10.00	5,418.65	Not stated.
Galassi Mosaic & Tile Company, 5 Ash Street, Boston, Mass.	5.22 4,410.90	7.25 942.50	0.90 45.00	5,398.40	In 8 weeks.
DePaoli Mosaic Association, 19 Damrell Street, South Boston, Mass.	4.32 3,650.40	8.73 1,134.90	0.75 37.50	4,822.80	In 4 weeks.

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APPENDIX TT.

CANVASS OF BIDS FOR FURNISHING MATERIALS FOR AND PLASTERING PORTIONS OF WALLS AND CEILINGS IN THE BOWDOIN STATION OF THE EAST BOSTON TUNNEL EXTENSION. APRIL 8, 1915.

BIDDER.	1,500 sq. yds. of plaster backing, ⅜ inch to ¾ inch thick.	700 sq. yds. of plaster backing, ¾ inch to 1½ inches thick.	350 sq. yds. of plaster backing, 1½ inches to 3 inches thick.	2,400 sq. yds. of white Portland cement plaster.	150 sq. yds. of grey finish plaster.	2,000 lin. ft. of arrises and exterior corners, ½ inch radius.	Filling 100 lin. ft. of grooves in ceiling with Portland cement mortar.	750 lin. ft. of sanitary base, 15 inches high, 1½ inches thick and with curved base.	Total.
	Item a	b	c	d	e	f	g	h	
Robert Gallagher Company, 166 Devonshire Street, Boston, Mass.....	$0.58 870.00	$0.65 455.00	$1.15 402.50	$0.48 1,152.00	$0.60 90.00	$0.12 240.00	$0.20 20.00	$0.40 300.00	$3,529.50
Muir Bros. Company, 201 Devonshire Street, Boston, Mass.....	0.50 750.00	0.65 455.00	0.90 315.00	0.45 1,080.00	0.75 112.50	0.10 200.00	0.12 12.00	0.55 412.50	3,337.00
Keith & Craffey, 816 Old South Building, Boston, Mass.....	0.40 600.00	0.70 490.00	0.95 332.50	0.43 1,032.00	0.65 97.50	0.09 180.00	0.15 15.00	0.35 262.50	3,009.50

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APPENDIX VV.

CANVASS OF BIDS FOR FURNISHING MATERIALS FOR AND PLASTERING WALLS AND CEILINGS IN THE ENLARGEMENT OF THE PARK STREET STATION. MAY 11, 1915.

BIDDER.	1,650 sq. yds. of grey Portland cement plaster, ⅜ inch to ¾ inch thick.	10 sq. yds. of grey Portland cement plaster, ¾ inch to 1½ inches thick.	10 sq. yds. of grey Portland cement plaster, 1½ inches to 3 inches thick.	1,680 sq. yds. of white Portland cement plaster, ⅛ inch to ¼ inch thick.	10 sq. yds. of grey Portland cement finish plaster.	2,150 lin. ft. of arrises and exterior corners, ¼ inch radius.	Total.	Time of Completion.
	Item a	b	c	d	e	f		
Muir Bros. Company, 201 Devonshire Street, Boston, Mass.	$1.10 1,815.00	$1.50 15.00	$2.00 20.00	$1.00 1,680.00	$2.00 20.00	$0.30 645.00	$4,195.00	Not stated.
Robert Gallagher Company, 166 Devonshire Street, Boston, Mass.	1.08 1,782.00	1.43 14.30	1.90 19.00	1.05 1,764.00	1.43 14.30	0.24 516.00	4,109.60	June 8, 1915.
Keith & Craffey, 816 Old South Building, Boston, Mass.	0.75 1,237.50	1.50 15.00	1.10 11.00	0.80 1,344.00	0.75 7.50	0.20 430.00	3,045.00	In 16 days.

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APPENDIX VV.

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APPENDIX WW.

CANVASS OF BIDS FOR REPAIRING GRANITE BLOCK PAVEMENT IN PATCHES AT VARIOUS PLACES OVER AND NEAR THE DIFFERENT SUBWAYS AND TUNNELS. (The prices include furnishing the tools, sand and paving gravel.) MAY 17, 1915.

BIDDER.	Price per Sq. Yd.	Remarks.
James J. Coughlan Company, 43 Tremont Street, Boston, Mass.	$0.80	In areas 5 sq. yds. or less.
James J. Coughlan Company, 43 Tremont Street, Boston, Mass.	0.70	In areas greater than 5 sq. yds.
James Doherty, 89 Hillside Street, Roxbury, Mass.	0.63	
Hugh Nawn Contracting Company, 82 Savin Street, Roxbury, Mass.	0.60	
John T. Shea, Jr., 696 East Sixth Street, South Boston, Mass.	0.58	
Bernard F. Hanrahan, 190 Paris Street, East Boston, Mass.	0.50	
Coleman Brothers, 1 Marginal Street, Chelsea, Mass.	0.49	

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APPENDIX XX.

CANVASS OF BIDS FOR FURNISHING AND ERECTING OAK HANDRAILS IN THE BOWDOIN AND SCOLLAY UNDER STATIONS OF THE EAST BOSTON TUNNEL EXTENSION. MAY 25, 1915.

BIDDER.	490 lin. ft. of 2 inch oak rail.	195 lin. ft. of 2½ inch oak rail	94 bends of 2½ inch oak rail.	44 bends of 2 inch oak rail.	113 bronze brackets.	56 bronze sockets.	45 cast iron posts.	Total.
	Item a	b	c	d	e	f	g	
M. S. Kelliher,								
13 Oak Street,	$0.41	$0.43	$2.65	$3.51	$2.80	$2.55	$6.17	
Quincy, Mass.	200.90	83.85	249.10	154.44	316.40	142.80	277.65	$1,425.14
O. H. Drisko & Son,								
166 Devonshire Street,	0.35	0.41	1.45	1.70	2.35	1.90	5.95	
Boston, Mass.	171.50	79.95	136.30	74.80	265.55	106.40	267.75	1,102.25
James E. Nelson Company,								
51 Beverly Street,	0.30	0.35	1.30	1.55	2.80	2.30	5.50	
Boston, Mass.	147.00	68.25	122.20	68.20	316.40	128.80	247.50	1,098.35
Anderson & Letteney,								
21 Wareham Street,	0.31	0.42	0.35	0.83	2.85	2.60	96.50	
Boston, Mass.	151.90	81.90	32.90	36.52	322.05	145.60	292.50	1,063.37

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APPENDIX YY.

CANVASS OF BIDS FOR BRICK SIDEWALK ON NORTHERLY SIDE OF BOYLSTON STREET BETWEEN ARLINGTON AND CHARLES STREETS. JUNE 3, 1915.

BIDDER.	Preparing subgrade, furnishing materials and laying 1,200 sq. yds. brick sidewalk. Item a	Preparing subgrade, furnishing materials and laying 350 lin. ft. brick edging. b	Total.	Time of Completion.
James J. Coughlan Company, 43 Tremont Street, Boston, Mass.	$1.07 1,284.00	$0.06 21.00	$1,305.00	June 20, 1915.
Coleman Brothers, 1 Marginal Street, Chelsea, Mass.	0.95 1,140.00	0.13 45.50	1,185.50	In 10 working days.
Northern Construction Company, 99 West Cedar Street, Boston, Mass.	0.94 1,128.00	0.12 42.00	1,170.00	In 4 days.
James H. Fannon, 28 Hinckley Street, Somerville, Mass.	0.90 1,080.00	0.25 87.50	1,167.50	Not stated..
B. F. Hanrahan, 190 Paris Street, East Boston, Mass.	0.89 1,068.00	0.15 52.50	1,120.50	June 15, 1915.
Hugh Nawn Contracting Company, 82 Savin Street, Roxbury, Mass.	0.95 1,140.00	0.15 52.50	1,192.50	In 1 week. (Water struck brick.)
Hugh Nawn Contracting Company, 82 Savin Street, Roxbury, Mass.	0.75 900.00	0.12 42.00	942.00	In 1 week. (Sand struck brick).

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APPENDIX ZZ.

CANVASS OF BIDS FOR FURNISHING AND ERECTING TWO PARAPET WALLS OF POLISHED GRANITE AROUND THE SUBWAY STAIRWAYS ON THE SURFACE AT BOWDOIN SQUARE, EAST BOSTON TUNNEL EXTENSION. JUNE 7, 1915.

BIDDER.	Amount.	Time of Completion.
W. A. & H. A. Root, Inc., 1 Beacon Street, Boston, Mass.	$1,842.00	In thirty days.
Deacon Brothers, Quincy, Mass.	1,350.00	In three weeks.
M. C. Monahan, West Quincy, Mass.	1,265.00	In five weeks.
Austin Ford & Son, Cambridgeport, Mass.	1,205.00	In three weeks.
Lavers Granite Company, Quincy, Mass.	1,150.00	In about 4 weeks, possibly sooner.

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APPENDIX BBB.

CANVASS OF BIDS FOR FURNISHING MATERIALS FOR AND PLASTERING PORTIONS OF WALLS AND CEILINGS IN THE SCOLLAY UNDER STATION OF THE EAST BOSTON TUNNEL EXTENSION. JUNE 24, 1915.

BIDDER.	4000 sq.yds. of plaster backing, ⅜ inch to ¾ inch thick.	300 sq. yds. plaster backing, ¾ inch to 1½ inches thick.	100 sq. yds. of plaster backing, 1½ inches to 3 inches thick, on curved surfaces.	4,500 sq. yds. of white cement plaster ⅛ inch to ¼ inch thick.	200 sq. yds. of grey finish plaster.	6,500 lin. ft. of arrises, etc., ½ inch radius.	Filling 200 lin. ft. of grooves around electric light conduits.	800 lin. ft. of sanitary base, 15 inches high, 1½ inches thick and with curved base.	Total.
	Item a	b	c	d	e	f	g	h	
Keith & Craffey, 816 Old South Building, Boston, Mass.	$0.48 1,920.00	$0.65 195.00	$0.90 90.00	$0.50 2,250.00	$0.60 120.00	$0.10 650.00	$0.12 24.00	$0.35 280.00	$5,529.00
Robert Gallagher Company, 166 Devonshire Street, Boston, Mass.	0.47 1,880.00	0.68 204.00	1.15 115.00	0.46 2,070.00	0.68 136.00	0.11 715.00	0.15 30.00	0.45 360.00	5,510.00
Muir Bros. Company, 201 Devonshire Street, Boston, Mass.	0.50 2,000.00	0.70 210.00	0..90 90.00	0.45 2,025.00	0.70 140.00	0.10 650.00	0.20 40.00	0.35 280.00	5,435.00

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APPENDIX CCC.

CANVASS OF BIDS FOR FURNISHING AND PLACING CONCRETE PLATFORM FINISH IN THE BOWDOIN STATION OF THE EAST BOSTON TUNNEL EXTENSION. (Work to be completed on or before July 24, 1915.) JUNE 29, 1915.

BIDDER.	85 cu. yds. of concrete masonry, 2 inches or more in thickness.	1,200 sq. yds. of granolithic wearing surface, 1 inch thick.	35 sq. yds. granolithic wearing surface, 1 inch to 2½ inches thick.	580 lin. ft. white cement edge, 6 inches wide and 2 inches thick.	Total.
	Item a	b	bb	c	
Warren Bros. Company, 59 Temple Place, Boston, Mass.	$11.00 935.00	$0.71 852.00	$1.25 43.75	$0.20 116.00	$1,946.75
A. E. Daddario & Company, 51 Edgewater Drive, Mattapan, Mass.	9.00 765.00	0.54 648.00	0.54 18.90	0.50 290.00	1,721.90
John Landis, 178 North Street, Boston, Mass.	7.60 646.00	0.56 672.00	1.00 35.00	0.19 110.20	1,463.20
Coleman Brothers, 1 Marginal Street, Chelsea, Mass.	8.00 680.00	0.52 624.00	0.90 31.50	0.20 116.00	1,451.50
Hugh Nawn Contracting Company, 82 Savin Street, Roxbury, Mass.	7.25 616.25	0.55 660.00	1.00 35.00	0.20 116.00	1,427.25
Albert I. Berry, 6 Beacon Street, Boston, Mass.	7.00 595.00	0.50 600.00	0.75 26.25	0.25 145.00	1,366.25

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